469790-03

Study Title

Test of Personal Insect Repellents

Data Requirement

OPPTS 810.3700

Author

Scott P. Carroll, Ph.D.

Study Initiation Date

23 October 2006

Study Completion Date

6 November 2006

Performing Laboratory

Carroll-Loye Biological Research
711 Oak Avenue
Davis, CA 95616

Laboratory Project ID

EMD-004.1 (Lotion)

STATEMENTS OF DATA CONFIDENTIALITY CLAIMS

1. No claim of confidentiality under FIFRA section 10(d)(1)(A),(B), or (C).

STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA section 10(d)(1)(A), (B), or (C).

Company: EMD Chemicals

Company Agent: Typed Name: Dan Giambattisto
Title: Senior Business Development Manager / Sponsor

Signature:

Study Monitor or Monitor's Agent

Date: November 8, 2006

TABLE OF CONTENTS

Good Laboratory Practice Compliance Statement	3
Quality Assurance Unit Summary	4
Information Summary	5
Testing Materials and Methods	6
Test Results	10
Conclusions	12
Appendix 1. Repellency Data Spreadsheet	13
Appendix 2. Completed Repellency Data Capture Forms	15
Appendix 3. Treatment Allocation and Dosing	18
Appendix 4. Environmental Data	19
Appendix 5. Deviations from the Protocol and their Consequences	22
Appendix 6. Physical Plan of CLBR Laboratory	27
Appendix 7. Study Protocol EMD-004	28
IRB Protocol Approval Documentation	
Informed Consent Form	
Appendix 8.Completed Dosimetry Data Capture Forms	79

Sponsor: EMD Chemicals, Inc.

GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

Study Compliance for the final report entitled Test of Personal Insect Repellents, Report EMD-004.1, for EMD Chemicals, Inc., Hawthorne, NY.

This study meets the requirements of U.S. EPA Good Laboratory Practice Regulations; Pesticide Programs (40 CFR 160).

6 November 2006

Scott P. Carroll, Ph.D.
Study Director and
Director of Efficacy Testing

Date

8 NOV. 2006

Date

Study Submitter

Date

Quality Assurance Statement to be inserted here

QUALITY ASSURANCE STATEMENT

Carroll-Loye Biological Research, GLP study for EMD Chemicals, Inc., Protocol Number EMD-004.1 (Lotion, Mosquito Repellent Efficacy, Field Study) Entitled "Test of Personal Insect Repellents" was inspected during various stages of the study. The data presented in the final report represent an accurate record of the raw data and the experimental findings. Records of results of facility inspections, study and final report audits are kept on file at Sierra Research Laboratories. The phases of the study inspected, dates and the findings were reported to management are as follows:

Phase Inspected	Date	Description
Protocol Review	26 October 2006	Protocol Review and Comments
In-Life Inspection And Audit	01 November 2006	Test Day 0 – Treatment, Application of Test Substances to Test System – Efficacy Evaluations
Letter to Management	06 November 2006	Letter Sent to C-LBR Management & Study Director
Final Report Audit	08 November 2006	Final Report Audit and QAU Statement

William A. Donahue, Jr. — 08 November 2006

William A. Donahue, Jr., Ph.D. — **Date**
Quality Assurance Unit

Information Summary

1) Objective

The objective of this study was to test the repellency of the Test Material to mosquitoes in nature.

2) Protocol Reference

Carroll-Loye protocol EMD-004, 'Test of Personal Insect Repellents' (Appendix 8; includes sponsor signature). Protocol EMD-004 and its associated consent form were approved by the Independent Investigational Review Board Inc. (Appendix 8).

3) Test Material

A topical insect repellent formulation intended for lotion delivery, with information as follows (Table 1). The sponsor's Certificate of Analysis is given in Appendix 6.

Table 1. Test Material information

Article no.	Description	Active ingredient	Hereinafter
WV29-01-9N (lot # M17345)	Lotion	IR3535	'Test Material' or 'lotion'

4) Untreated Control
Untreated skin (hereinafter 'Untreated Control').

5) Deviations from the Protocol
Deviations from the protocol and their consequences are given in Appendix 5.

Testing Materials and Methods

1) Test Sites and dates

Dosimetry testing was conducted in the Arthropod Behavior Laboratory at Carroll-Loye Biological Research on several days in late October 2006. Repellency testing was conducted in the field in Butte and Glenn Counties, California. Field efficacy tests were in dense forest in Butte County on 25 October 2006, and in moist pasture and marshland in Glenn County on 1 November 2006. These areas differed in the composition and relative abundance of foraging mosquito species present.

2) Environmental Conditions

Temperature relative humidity and light intensity were recorded at approximately 1-hour intervals during efficacy testing.

3) Human Study Subjects

Twelve human subjects were used in measurements of dosage. Ten human subjects exposed the test material to mosquitoes for efficacy evaluation. A sample size of ten subjects was chosen for efficacy testing to give a reasonably large statistical population size while avoiding exposing too many individuals to the minor but present risks associated with exposure to biting arthropods. Subjects were 18 years or more of age, believed themselves to be in good physical condition, had not used repellents in the week prior to enrolling in the study, were not students or employees of the Study Director, did not believe themselves to be allergic to mosquito bites, refrained from using alcoholic beverages or smoking during the test, and signed the IRB approved Informed Consent Form. Females were negative in pregnancy tests conducted the morning of the day they participated in testing, and stated that they were not lactating.

4) Mosquitoes

Mosquitoes were engaged as encountered in nature. Sites were chosen based on surveillance data compiled by the California State Department of Health Services. Our goal was to find sites with active *Aedes* spp. and *Culex* spp. populations from which West Nile or related viruses had not been recently isolated. Counties in the Central Valley of California generally sustain large populations of mosquitoes late in the year, making the Valley one of the only areas in the United States suitable for mosquito efficacy testing as winter approaches. One sentinel chicken flock had a single positive for WNV in the region in the month preceding our work, but flocks closer to our sites had not. Importantly, a survey of several thousand mosquitoes in

areas close to our study sites the week previous revealed no presence of WNV in tests by the US Centers for Disease Control (personal communication, Dr. Deborah Lemanager, Vector Ecologist, Sutter Yuba Mosquito Abatement District, Yuba City, California). Dr. Lemanager regarded WNV activity in Northern California as being effectively concluded for 2006.

Mosquitoes that landed on the protective Tyvek coveralls worn by subjects, or on exposed limbs, were collected by subjects using mechanical aspirators. They were then pooled and labeled by a technician, frozen, and then identified in the laboratory using taxonomic keys and stereomicroscopy.

5) Dosage determination

To determine dosage, we measured arm and leg surface area for individual subjects based on the length and a set of four circumferences taken from each limb. After practicing with the lotion to get a feel for its application properties, subjects completed a series of three self-applications to each limb. Before and after each application, a technician weighed the tube containing the lotion on a traceably calibrated Sartorius GC 2502 (measurement increment 0.001 g, 500 g capacity). A mean dosage was calculated for each subject per unit area of skin surface. Seven females and five males participated (subjects 2, 4, 6, 9, 13, 14, 19, 23, 26, 30, 42, 56).

The grand mean of subject means was then used as the dosage rate for the efficacy testing. Those applications were made volumetrically, based on the limb surface areas of each subject and the specific gravity of the lotion repellents (ca. 1 g/ml, or very close to water, based on a series of 1 ml measurements made from each tube of test material, which we weighed on a traceably calibrated Sartorius H51 balance (measurement increment 0.0001 g, 30 g capacity).

6) Test Materials and their application

Test Materials were produced in February 2006. They were couriered to Carroll-Loye Biological Research on 7 April 2006, with Chain-of-Custody documented. They were then stored at the Carroll-Loye Offices at in a closed cabinet at room temperature (20-24°C).

Ten subjects tested the Test Material in each of two habitats. For studies at test site 1, "Forest", Test Materials were applied at the site to 7 females and 3 males. For studies at test site 2, Marsh/Pasture, which required greater travel time to access, Test Materials were applied in the laboratory, in advance of travel to the test site (4 females, 6 males). That was so the sufficient time would remain in the day for a long-duration test. In that case, subjects were instructed to minimize abrasion of the treated skin during travel to the site.

Individual doses were prepared for each subject on the basis of the surface area of their forearm skin. The dosing rate was 0.0010 ml of Test Material per square cm of skin surface area

Before the Test Material was applied, subjects washed their hands and arms carefully with a fragrance-free cleanser, rinsed them with 35% ethanol in water, and then dried them with clean towels. They then donned white Tyvek® coveralls, rolling sleeves or legs to permit application of the repellent lotion. The rolled material of the garment was held in place with Co-Flex cohesive flexible bandage. That bandage was also wrapped to cover and protect the vulnerable elbow and knee portions of the exposed limbs from access by mosquitoes. The Test Material was then applied by Carroll-Loye Technicians, using a syringe and a fingertip in a surgical glove, to spread the materials as evenly as possible.

Treatments were divided between arms and legs. When a subject served in more than one trial, a different limb was treated in the subsequent trial. The treatment allocation and dosing is given in Appendix 3.

7) Exposure to mosquitoes

All subjects wore head nets and surgical gloves in addition to Tyvek coveralls, and each carried a mechanical aspirator. Treated subjects were partnered into groups of two. Each member of a partner pair was instructed to monitor their own exposed limb and that of their partner for mosquito landings during one-minute periods of exposure to mosquitoes (a "buddy system"). Exposures took place at 15-minute intervals, which began 15 minutes after applications of the Test Material at the Forest site, and approximately 3 hours and 15 minutes after applications at the Marsh/Pasture site. A technician advised subjects when the one-minute period began and ended. Subjects immediately remove any LIBing mosquitoes (Liting with Intent to Bite) from the skin with repellent with a mechanical aspirator. All LIBes were reported to technical personnel who recorded the events by subject code and the clock time of exposure interval. At the end of each one-minute exposure period, subjects moved away from the area with mosquito activity. This was accomplished by moving out of the forest at Site 1, and onto sunlit open roadways or into a screen house at Site 2.

Subjects immediately covered exposed skin with the protective garment if a LIBe followed another in the same or in either of the two previous exposure periods. Both subjects and data recording personnel played an active role in monitoring the temporal pattern of LIBes to ensure proper resposes.

Ambient LIBe pressure was measured by two experienced personnel on the same schedule as that for repellent exposure. These negative control subjects were attended by two assistants who use mechanical aspirators switched on throughout the period to quickly remove any LIBing mosquitoes . One control subject exposed an arm, and the other, a leg. The controls protected their exposed limb as soon as a LIBe occurred.

8) Data recording

Data were recorded by the Study Director every 15 minutes, after each one-minute exposure. Data from first exposures were recorded as taking place at 15 minutes after application (Forest Site) or three hours and 15 minutes after application (Marsh/Pasture Site).

9) Data Analyses

Descriptive statistics were generated with the software 'SAS JMP' Version 5.0.1.2 (SAS Institute, Cary NC).

We calculated Complete Protection Time (CPT) as the interval between application and the First Confirmed LIBe. The First Confirmed LIBe was defined as the first LIBe followed by another LIBe within one-half hour, i.e., in either of the subsequent two exposure periods. This measure is identical to that of 'First Confirmed Bite', which was classically used in measures of repellency to biting insects, with the exception that our practices minimized the probability that a subject was actually bitten by a foraging mosquito. Complete Protection Time measured in this way gave a single duration value for each subject. Mean CPT was calculated across all 10 subjects, and is presented herein with standard deviation and 95% confidence interval information as well.

Test Results

Dosimetry

Estimates from dosimeters indicated that individuals varied substantially in the amount of Pump Spray that they applied. Some were consistent across limbs, but others were not. The mean dosing rate was 0.0011±0.0003 g per cm^2, or 0.0011 g ml per cm^2, based on the specific gravity of the Test Material being nearly identical to that of water.

Environmental Conditions

Most environmental conditions were in the same narrow span of values in the Forest and the Marsh/Pasture test sites. Temperature ranged from 19-25 °C, relative humidity from 24-39%, wind speed from 0.0-3.9 kph and ambient light from 319-695 lux (Forest) and 501-1176 lux (Marsh/Pasture). Environmental data are given in Appendix 4.

Mosquito species present

Collected mosquitoes were pooled by site. The Forest Site contained an abundance of Aedes mosquitoes, principally *Aedes melanimon* (N=136), *Aedes vexans* (N=11), *Aedes nigromaculus* (N=1), *Anopheles freeborni* (N=1), and *Culex tarsalis* (N=1). The Marsh/Pasture site, in contrast, contained a much higher proportion of *Culex* mosquitoes, especially *Culex tarsalis* (N=117), as well as *Culex pipiens* (N=7), and also *Aedes melanimon* (N=127).

Ambient LIBing Pressure

In the Forest Site, 30 of 33 untreated arm samples, and 31 of 33 untreated leg samples, registered one or more mosquitoes. In the Marsh/Pasture Site, one mosquito was registered in all samples on both limbs. More than one mosquito approached untreated limbs in a majority of exposures, such that a limb left exposed for a full minute period would have registered more than one LIBe.

Influence of Test Material on Probability of LIBes

Mosquitoes were strongly affected by the Test Material, and alighted on subjects with intent to bite in only a minority of exposures. Table 2 shows the time between application and withdrawal from the test for each of the 10 subjects. Treatments to arms versus legs performed similarly and are not considered separately. The raw data are given in Appendix 1.

Table 2. Lotion protection: Complete Protection Time (CPT) in descending order, cause of withdrawal and number of LIBes, by subject.

Subject no.	CPT[1]	Withdrew due to FCL[2]?	Total LIBes
Forest Site			
21	8.50	No	1
26	8.50	No	0
19	8.00	Yes	2
23	7.75	Yes	3
14	7.50	Yes	2
4	7.25	Yes	3
15	7.00	Yes	2
13	6.50	Yes	3
9	6.00	No	0
30	6.00	No	0
Marsh and Pasture Site			
19	10.00	No	0
50	9.75	No	0
55	9.00	Yes	3
24	8.75	Yes	2
53	8.50	Yes	2
52	8.00	Yes	2
54	8.00	Yes	2
15	7.75	Yes	3
13	7.75	No	0
30	7.75	No	0

[1] Complete Protection Time, the hours until the First Confirmed 'Lite with Intent to Bite' ('LIBe'), defined as the first LIBe followed by another within 30 minutes (i.e., in one of the subsequent two exposure periods). To CPTs for subjects not receiving a confirming LIBE, 15 minutes is added to estimate to minimum possible CPT that could have been recorded had exposures continued.

[2] This column indicates whether a subject was withdrawn due to receiving a confirming LIBe, or alternatively, because they received no confirming LIBe before withdrawing for other reasons or the cessation of testing at dusk.

[3] Including the confirming LIBe when one occurred.

In the Forest Site, CPTs ranged from 6 to 8.5 hr (Table 2). Mean (±SD) CPT was 7.3 ±0.93 hr, with a 95% confidence interval of 6.6 - 8.0 hr. Subjects experienced from 0 - 3 LIBeS (mean ± SD, 1.6 ± 1.3). Four of the 10 subjects received no confirming LIBe before withdrawing (Table 2), and so would have registered longer protection had their testing been extended. The longest values are for two subject protected until the tests conclusion at dusk, while the briefest are for two subjects that withdrew from the study for reasons unrelated to product performance. Excluding those latter two values gives a still-conservative revised estimate of mean CPT of 7.6 ±0.71 hr, with a 95% confidence interval of 7.0 - 8.2 hr

In the Marsh/Pasture site, CPTs were somewhat longer, ranging from 7.75 to 10 hr (mean 8.5 ± 0.84 hr, 95% CI 7.9-9.1 hr). Subjects experienced from 0 - 3 LIBes (mean ± SD, 1.3 ± 1.2). The distribution of subjects without confirmed LIBes was about the same as in the Forest Site. The mean value of CPT is again necessarily underestimated due to limitations in the duration of daylight for sampling and participation constraints of the two subjects. Excluding the early-leavers, as for the Forest Site, gives a revised estimate of mean CPT of 8.7 ±0.82 hr, with a 95% confidence interval of 8.0 - 9.4 hr.

Conclusions

Test Material WV29-01-9N, a 10% IR3535 lotion, provided substantial and prolonged protection against foraging mosquito communities in two natural habitats. The average Complete Protection Time (CPT), across habitats, was approximately 8 hours, an exceptionally long mean for a mosquito repellent. Subjects received between one and two LIBes, on average, over this period. Ambient biting pressure was sufficient throughout the test.

Because early failures cannot be rescued by later repulsions, compared to Relative Protection analyses, CPT may result in the reporting of briefer protection times for any repellent in which the study system does not result in a reasonably rapid, highly structured (e.g., exponential) decline in performance. In the present study, that effect is likely accentuated by the truncation of 40% of the individual exposure periods, either by the onset of dusk or via subjects choosing to withdraw for reasons unrelated to the test. The mean reported is therefore a conservative estimate of the duration of expected typical protection from this product.

In summary, the present data set indicates that EMD Chemicals, Inc. repellent lotion WV29-01-9N gives an average of approximately 8 hours or greater of Complete Protection against a diversity of biting mosquitoes.

confirming LIBe before withdrawing (Table 2), and so would have registered longer protection had their testing been extended. The longest values are for two subject protected until the tests conclusion at dusk, while the briefest are for two subjects that withdrew from the study for reasons unrelated to product performance. Excluding those latter two values gives a still-conservative revised estimate of mean CPT of 7.6 ±0.71 hr, with a 95% confidence interval of 7.0 - 8.2 hr

In the Marsh/Pasture site, CPTs were somewhat longer, ranging from 7.75 to 10 hr (mean 8.5 ± 0.84 hr, 95% CI 7.9-9.1 hr). Subjects experienced from 0 - 3 LIBes (mean ± SD, 1.4 ± 1.3). The distribution of subjects without confirmed LIBes was about the same as in the Forest Site. The mean value of CPT is again necessarily underestimated due to limitations in the duration of daylight for sampling and participation constraints of the two subjects. Excluding the early-leavers, as for the Forest Site, gives a revised estimate of mean CPT of 8.7 ±0.82 hr, with a 95% confidence interval of 8.0 - 9.4 hr.

Appendix 1. Raw data showing repellency of EMD Chemicals, Inc. EUS26-15-9N insect repellent Pump Spray.

0 = no LIBEs in a 1-min expousre
1 or 2 = 1 or 2 LIBEs/exposure

Site 1. Forest

Hours since applic				1				2				3				4				5				6				7				8	
Clock time			10				11				12				13				14				15				16				17		
Interval	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	14	15	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**
Subj																																	
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0	**1**		
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	1	**1**							
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2			
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2					
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	1	**1**	
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										

Site 2. Marsh/wet pasture

Hours since applic	0				1				2				3				4				5				6				7				8				9			
Clock time		8				9				10				11				12				13				14				15				16				17		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	14	15	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Subj																																								
13														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
15														0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	2								
19														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**						
54														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**						
55														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	2			
24														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2				
30														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
50														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2						

Appendix 2. Completed Data Capture Forms

25 OCT 2006
EMD-004

Forest SITE, BUTTE Co.
TREATMENT A

Subjects:

	Control Arm	Leg	26	27	28	29	30	13	14	15	16	18	20
1	-	-	0	0	0	0	0	0	0	0	0	0	0
2	-	-	0	0	0	0	0	0	0	0	0	0	0
3	-	-	0	0	0	0	0	0	0	0	0	0	0
4	-	-	0	0	0	0	0	0	0	0	0	0	0
5	0	-	0	0	0	0	0	0	0	0	0	0	0
6	-	-	0	0	0	0	0	0	0	0	0	0	0
7	-	-	0	0	0	0	0	0	0	0	0	0	0
8	-	12	0	0	0	0	0	0	0	0	0	0	0
9	-	-	0	0	0	0	0	0	0	0	0	0	0
10	-	-	0	0	0	0	0	0	0	0	0	0	0
11	-	-	0	0	0	0	0	0	0	0	0	0	0
12	-	-	0	0	0	0	0	0	0	0	0	0	0
13	-	-	0	0	0	0	0	0	0	0	0	0	0
14	-	-	0	0	0	0	0	0	0	0	0	0	0
15	-	-	0	0	0	0	0	0	0	0	0	0	0
16	-	-	0	0	0	0	0	0	0	0	0	0	0
17	0	-	0	0	0	0	0	0	0	0	0	0	0
18	-	-	0	0	0	0	0	0	0	0	0	0	0
19	0	-	0	0	0	0	0	0	0	0	0	0	0
20	-	-	0	0	0	0	0	0	0	0	0	0	0
21	-	-	0	0	0	0	0	0	0	0	0	0	0
22	-	-	0	0	0	0	0	0	0	0	0	0	0
23	-	-	0	0	0	0	0	0	0	0	0	0	0
24	-	-	0	0	0	0	0	0	0	0	0	0	0
25	-	-	0	0	0	0	0	0	0	0	0	0	0
26	-	-	0	0	0	0	0	0	0	0	0	0	0
27	-	-	0	0	0	0	0	0	0	0	0	0	0
28	-	-	0	0	0	0	0	0	0	0	0	0	0
29	-	-	0	0	0	0	0	0	0	0	0	0	0
30	-	-	0	0	0	0	0	0	0	0	0	0	0
31	-	-	0	0	0	0	0	0	0	0	0	0	0
32	-	-	0	0	0	0	0	0	0	0	0	0	0
33	-	-	0	0	0	0	0	0	0	0	0	0	0

	9	8	21	19	15	14	13	9	8	30
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0

	9	8	21	19	15	14	13	9	8	30
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0

0930 →
Applications
9:05-9:20
(me 9:15 average)

15 MIN INTERVALS

DISTRIBUTION OF LIBES

DEPARTED — WITHDRAWN — DEPARTED — WITHDRAWN — DEPARTED

1 NOVEMBER 2006

EMD-004

SITE #2 Marshland/Wet Pasture
Glenn Co.
TREATMENT A

Controls: Subjects: Arm Log

PREP & TRAVEL #	53	50	36	24	56	54	52	19	15	13
1										
2										
3										
4 (1100 →)	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	1	0
19	0	0	0	0	1	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	—	0	0	0	0	0	2	—
23	0	0	—	0	0	0 (EE) 8 INV 2006	1	0	—	—
24	0	0	—	0	0	1	0	0	—	DEPARTED
25	2	0	DEPARTED	0	0	1	1	0	WITHDRAWN	—
26	—	0	—	2	0	—	—	0	—	—
27	WITHDRAWN	0	—	—	2	WITHDRAWN	WITHDRAWN	0	—	—
28	—	0	—	WITHDRAWN	—	—	—	0	—	—
29	—	0	—	—	WITHDRAWN	—	—	0	—	—
30	—	-DARK-	—	—	—	—	—	0	—	—
31	—	—	—	—	—	—	—	DARK	—	—

Applications 7:30-8 AM X = 7:45

15 Minute Exposure Intervals

DISTRIBUTION OF LIBES

[signature]

Appendix 3. Treatment allocation and dosing

Site 1. Forest

Subject #	Limb	Surface area cm^2	Dosage (ml)
21	RL	910	1.00
26	LL	881	0.97
19	RL	1038	1.14
23	RA	477	0.52
14	LL	1076	1.18
4	RL	826	0.91
15	LL	880	0.97
13	RL	1134	1.25
9	RL	1095	1.20
30	RA	440	0.48

Site 2. Marsh/Pasture

Subject #	Treatment	Surface area cm^2	Dosage (ml)
19	LA	LL	1.12
50	RL	RA	0.45
55	RL	LL	1.09
24	RL	RL	0.99
53	RL	LL	1.07
52	LL	LA	0.72
54	LA	LA	1.09
13	RL	LA	0.62
15	LA	LA	0.61
30	RA	RA	0.48

Appendix 4. Environmental Record

ENVIRONMENTAL CONDITIONS

Sponsor: EMD Chemicals **Locale: Forest Site, Wildlife Area, Butte Co. CA**
Study: EMD-004 **Observer: Scott P. Carroll**
Date: 25 October 2006

Time	Temp°C	Humidity	Windkm/hr	Light	Sky	Other
1000	19	26	3.9	514	Clear	
1100	20	25	1.0	440	Clear	
1200	20	24	1.2	335	Clear	
1300	21	24	2.8	318	Clear	
1400	20	26	2.9	297	Clear	
1500	21	24	1.8	464	Clear	
1600	21	24	2.2	695	Clear	
1700	20	25	1.9	455	Clear	

Additional comments:
Very windy outside of forest; mosquitoes concentrated within woodland, sheltered from wind.

Observer signature:

Carroll-Loye Biological Research

711 Oak Avenue Davis, California 95616 Tel (530) 297-6080 Facsimile x6081

ENVIRONMENTAL CONDITIONS

Sponsor: EMD Chemicals
Study: EMD-004
Date: 1 November 2006

Locale: Basin Wildlife Area, Glenn Co., CA
Observer: Scott Carroll

Time	Temp°C	Humidity	Windkm/hr	Light	Sky	Other
1100	24	32	0	818	PC	
1200	25	30	0	1176	Clear	
1300	22	36	0	1776	Clear	
1400	24	39	0	1150	Clear	
1500	23	39	0	960	PC	
1600	21	39	0	710	PC	
1700	20	39	0	501	PC	

Additional comments:

Observer signature:

4. The dosimetry data capture forms were modified from those appended in the protocol.

   The efficiency and accuracy of data collection were improved.

5. Sponsor concerns about the formulation of the aerosol led us to remove that product from the efficacy trials. That change led to a loss of blinding for the Study Director.

   The quality of the data set and analyses are not adversely affected. That is because the specified blinding was not integral to the chief goals of the study; the sponsor is not interested in a comparison of performance between the actives, and the contrast between treated and untreated subjects is unambiguous and unequivocal. In other words, there is little or no opportunity for advance knowledge of the treatment distribution to influence the study outcome.

Submitted By: _____ November 6, 2006
Study Director **Date**

Acknowledged _____ 08 Nov 2006
Quality Assurance Representative **Date**

Acknowledged _____
Study Monitor or Monitor's Agent

Date: November 8, 2006

Appendix 5. Deviations from the protocol and their consequences

1. In each field trial, two subjects terminated exposures before reaching the stopping criterion.

   The influence of those subjects withdrawing results in an underestimate of Complete Protection Time for each of those subjects and thus an underestimate of the mean CPT provided by the Test Material in this study.

2. With the Study Director's consent, subjects did not always cover treated limbs between exposures when it was straightforward to avoid mosquitoes in the interim periods (e.g., by stepping out of the forest at Site 1, and by entering the screen house at Site 2.

   This deviation probably reduced abrasion of the Test Material by the coveralls.

3. During dosimetry, the stipulated number of practice applications proved excessive, and so was reduced from three to one for most subjects. While more applications might have been appropriate for subjects unfamiliar with applying lotion products to their own skin, all subjects regarded a single practice application as more than sufficient.

   Subject exposure to the Test Material was reduced, and the quality of the data set is not seriously affected.

4. The dosimetry data capture forms were modified from those appended in the protocol.

   The efficiency and accuracy of data collection were improved.

5. Sponsor concerns about the formulation of the aerosol led us to remove that product from the efficacy trials. That change led to a loss of blinding for the Study Director.

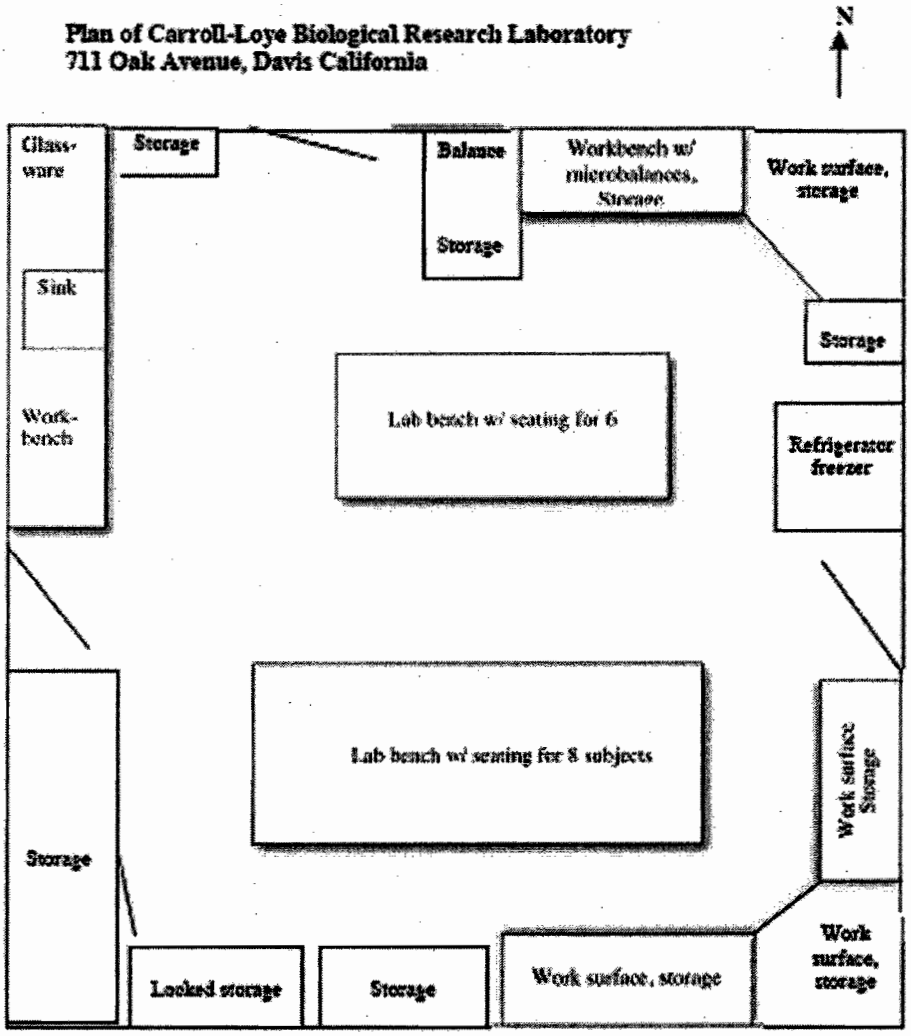
   The quality of the data set and analyses are not adversely affected. That is because the specified blinding was not integral to the chief goals of the study; the sponsor is not interested in a comparison of performance between the actives, and the contrast between treated and untreated subjects is unambiguous and unequivocal. In other words, there is little or no opportunity for advance knowledge of the treatment distribution to influence the study outcome.

Submitted By: _____ November 6, 2006
Study Director **Date**

Acknowledged _____ _____
Quality Assurance Representative **Date**

Acknowledged: _____ _____
Sponsor's Representative **Date**

Appendix 7. Physical plan of Carroll-Loye Biological Research Laboratory



Interior dimensions: 18.5' E-W, 20' N-S

Version 2, June 2006

Appendix 8. Study Protocol EMD-004

IRB Protocol Approval Documentation

Informed Consent Form, version of 1 November 2006

COVER PAGE

EFFICACY TEST PROTOCOL EMD-004

©2006 by Scott Prentice Carroll

TEST OF PERSONAL INSECT REPELLENTS

SYNOPSIS

The study pursuant to this insect repellent efficacy protocol is intended to provide data under the requirements of United States Environmental Protection Agency Guideline OPPTS 810.3700. This protocol, dated 1 November 2006, is a revision of the prior submitted EMD-004, based on suggestions made during the HSRB meeting of 18 October 2006. Principal changes are the inclusion of a monitoring physician on call during tests (§9.5), clarification that untreated control personnel will be subject to the same exclusion criteria as are test subjects (§9.1.4.1.i), and stating that subjects will be reassured that their rights to withdraw are not compromised in cases in the Study Director goes to considerable effort or expense to include them (§9.1.4.2). In addition, the California Human Subject's Bill of Rights has been restored to the protocol.

1.

EFFICACY TEST PROTOCOL EMD-004

©2006 by Scott Prentice Carroll

TABLE OF CONTENTS

Protocol	2
Protocol Approval Signatures	40
Appendices: Test Material Formulations	41
Sample data recording forms	43
Informed Consent documentation	47

1 TITLE: TEST OF PERSONAL INSECT REPELLENTS

2 PROTOCOL NUMBER:

EMD–004

3 SPONSOR:

EMD Chemicals, Inc.

3.1 Address:

7 Skyline Drive, Rona–Cosmetic Business Unit
Hawthorne, NY 10532 USA

4 PROTOCOL OBJECTIVE:

4.1 Type of Protocol:

This protocol will indicate the specific methods to be used and direct the conduct of the Study EMD–004. The study will be conducted in the laboratory at the letterhead address and at locales in nature with mosquitoes.

Note that this protocol formerly functioned in tandem with the general Carroll-Loye Protocol C-L–001, entitled "Protocol for Tests of Personal Insect Repellents". That protocol presented the domain of and universal instructions for conducting tests of this class, as formerly required by the California Environmental Protection Agency. Elements of Protocol C–L-001 have now been incorporated directly into this protocol, and C–L-

001 no longer applies. Both that protocol and this protocol were developed by Dr. Scott Carroll, Director of Research, Carroll-Loye Biological Research.

5 STUDY OBJECTIVE, RATIONALE AND STANDARDS:

5.1 Objective of Research:

To test the repellent characteristics of the Test Materials against mosquitoes, with efficacy measured as Complete Protection Time. Complete Protection Time, or CPT, is defined herein as the time between application of Test Material and the First Confirmed 'Lite with Intent to Bite.' A 'Lite with Intent to Bite', or 'LIBe', occurs when a mosquito alights on the treated test skin of a subject and extends its proboscis to the skin surface while ceasing locomotion. A 'First Confirmed LIBe' is that which is followed by another within 30 minutes. This work conducted pursuant to this protocol will be initiated by determining the amount of each of the repellents that subjects typically apply. Dosimetry will consist of a behavioral assay utilizing passive dosimetry.

5.2 Rationale and Main Endpoint:

This study will test the efficacy of new formulations of IR3535, created by the developer of IR3535, which are intended to increase cosmetic quality for better user acceptance. US/EPA requires new repellent formulations to be registered, and some registrants must present efficacy data as part of the registration review. The rationale for this study is to provide that efficacy data, which has not been previously collected. Compared to the insect repellent 'DEET' (N,N-diethyl-m-toluamide), there are few data examining the efficacy of IR3535 in different formulations. In addition, IR3535 has not been widely studied in the United States at end-product concentrations as high as those to be tested here. Yet the excellent safety profile of IR3535 indicates that it is suitable for testing at higher concentrations than have typically been studied.

Stability of the end-products will be tested in a different study.

The main endpoint of this study will be the conclusion of a mosquito repellent efficacy study conducted in the field of three IR3535-based topical repellent formulations, with the data set suitable for submission to US EPA for insect repellent registration purposes. The efficacy study will consist of two field trials, with 10 treated subjects in each trial testing each formulation, and two untreated subjects in each trial. Initial dosage determination ('dosimetry') will be conducted with a set of 12 subjects, some of whom may then go on to participate in efficacy testing.

Dosimetry will be conducted at the letterhead address. When 12 subjects have completed dosimetry, those data will be used to determine dosing for all efficacy trials with the actives, including those against other arthropods (i.e., including the tick repellent efficacy test, which is described in Carroll-Loye Protocol EMD-003). Protocol EMD-003, and this protocol, EMD-004, are independent in all other ways, except that individual subjects are not proscribed from participating in both studies.

5.3 Rationale for use of Human Subjects:

Human subjects are required because they represent the target system for the test materials, and sufficiently reliable models for repellency testing have not been developed. In addition, subjects will self-administer the test articles during dose determination. There are no accepted methods of modeling the complex relationship between spray delivery systems and target subjects. At least ten subjects are required in order to reduce variation around the population means we will describe. Data of this type are not available from other studies, and so it is advisable to test the comparatively large number of subjects proposed in case variance among them is high. The low toxicity of the test materials should mean that there is little incremental risk associated with increasing sample size. In addition, in pre-test meetings, human subjects were deemed appropriate by the same US/*EPA* toxicologist who also evaluated risk for the sponsor's Federal registration of the active ingredient.

5.4 Balance of Risks and Benefits:

The study-associated risks are of three types: exposure to the test materials themselves, exposure to biting arthropods, and possible exposure to vectors of arthropod-borne diseases. As described below, subject health and safety are unlikely to be impacted by any study-associated risks during or after the study.

The repellent active ingredient has a low acute and chronic risk profile, established both through experimentation and through long-term consumer use. The concentrations of the active ingredient in the product being tested match those of products currently EPA-registered and marketed in the US. Subjects with known allergic reactions to insect repellents and common cosmetics are excluded from participating. 'Repeat' exposures during dosimetry are all brief before the repellent is washed off, and likely total a much shorter duration of exposure than a typical single consumer application would. Risks associated with inhalation and ingestion would require gross intentional mishandling by subjects, a scenario that the study methods do not promote.

The risk of a skin reaction to a mosquito bite is reduced by excluding candidate subjects who are aware of having a history of such reaction. In addition, subjects will be trained to quickly remove any mosquitoes that attempt to bite them, before penetration or injection of saliva if possible. Moreover, a stopping rule instructs subjects to cover any treated skin immediately if more than one mosquito attempts to bite during any exposure period. Subjects will be exposing small areas of treated skin for only 4 minutes per hour. Other parts of the body will be protected with provided fabric. Subjects will be teamed with a partner for joint observation and experienced technical personnel will be present at all times to assist.

The US Centers for Disease Control estimates that about 1-in-5 people who become infected with West Nile virus will develop West Nile fever. Subjects are instructed to be alert for any flu-like symptoms (unusual tiredness or unusually severe headaches, body aches, fever, or a rash on the trunk of the body) for up to two weeks after the test. About 1-in-150 infected people will develop more serious symptoms, which will be described to the subjects. Most people (about 4 out of 5) who are infected with West Nile virus will not develop any type of illness.

In addition, the techniques employed to minimize exposure to mosquitoes and mosquito bites render the possibility of contracting a disease carried by mosquitoes very low. Field tests are being conducted in an area where such viruses have not been detected by county and state health or vector/mosquito control agencies for at least a month, so the risk is probably low that any individual mosquito present carries a disease. Only experienced professionals (the Study Director and/or other qualified researchers) will expose untreated limbs to monitor biting pressure, at the same infrequent, brief intervals as treated subjects, and with multiple assistants to remove any mosquitoes that lite with intent to bite.

In summary, the combination of technical precautions and natural factors means that the chances that any subject will contract West Nile fever or another disease from a mosquito bite are probably extremely small. There is probably no more risk to subjects than they would experience when engaged in normal outdoor activities in a similar rural area at the same time of year. If at anytime during the study a subject suffers a skin reaction or feels ill, he or she is instructed to inform the Study Director (i.e., the 'Principal Investigator'), or anyone else who is also working to direct the study). Such subjects will be immediately withdrawn from testing and medical management will be implemented (§9.5). Subjects may also request access to standard first aid materials (such as bandages, antiseptics, and mild topical and oral antihistamines) and request qualified first aid assistance at any time. Epi-Pens will also be on-site in case of Type 1 (anaphylactic) allergic reaction. At least

one qualified researcher will remain with the other test subjects if other researchers depart with an injured or ill subject. Subjects are clearly and repeatedly informed that they may remove themselves for any reason from the study at anytime, without penalty to their compensation.

Against the slight risks are balanced substantial and reasonably likely benefits. Insect-borne disease is of growing significance in the United States and around the world where U.S. citizens are active. Discomfort associated with nuisance biting restricts many work and pleasure activities. DEET-based repellents have been the only reliable personal protection for many decades. However, health, comfort and practical concerns about DEET have restricted its use below a level ideal for public and personal health issues. The majority of marketed DEET-alternatives is of relatively very low efficacy. This study tests a repellent of well-known high efficacy, consumer safety and acceptability. It is one of only two or three repellent actives that have ever been in a position to serve as a DEET-alternative of public health value. This study will give a good estimate of a minimum time of expected excellent protection, using standards, safety practices and design that are all conservative. Few studies have examined IR3535 at a concentration as high as that tested here. Hence its maximum potential efficacy, particularly as influenced by each specific formulation, is poorly known. Because EPA-registration requires efficacy data, a test such as this one is the only path toward further product development and greater availability of superior IR3535 products to consumers in the United States.

5.5 Standards Applied:

U. S. EPA Good Laboratory Practice Regulations (40 CFR 160); 40 CFR 26 subparts K and L; FIFRA § 12(a)(2)(P); California State EPA Department of Pesticide Regulation study monitoring (California Code of Regulations Title 3, Section 6710).

6 INVESTIGATIONAL AND TEST MATERIAL CONTROL:

6.1 Test Substance:

6.1.1 Description of the Test Substance

Formulations containing EMD's proprietary IR3535-based repellent will be tested. IR3535 is a US/EPA-registered repellent active ingredient, Ethylbutylacetylamino-propionate. It is the active ingredient in numerous registered commercial personal insect repellents marketed worldwide, including the US/EPA-registered Avon Bug Guard line. The three test formulations are

Lotion WV29-01-9N (lot # M17345), Aerosol EUS26-16-9N (lot # M17346), and Spray EUS26-15-9N (lot # M17279). They are "pending products" to be submitted to EPA for registration as insect repellents. Details of the test formulations are appended.

6.1.2 Trade Name:

TBD

6.1.3 Dosage Form:

Liquid applied to exposed skin.

6.1.4 Dose:

Determining dosage is a main objective of this study. Dosage for repellency testing will be the mean of the subject means determined for each product in the dosimetry portion of this study. Dosage will be measured in weight and reported by weight and volume.

6.1.5 Manufacturing Site:

ACCRA PAC Inc., Elkhart Indiana USA.

6.1.6 Test Material Storage During Study:

Prior to application, test materials will be stored indoors, at room temperature and away from direct sunlight or direct sources of moisture. Storage will be at Carroll-Loye Biological Research.

6.1.7 Test Material Safety:

EPA regulates use of inert ingredients (also termed "other" ingredients) by toxicology profiles in animal tests and by their inclusion in EPA lists of "approved" other ingredients. Ingredients on lists 4a or 4b are considered relatively safe for all uses. The ingredients in the proposed insect repellent formulations are mainly on lists 4a or 4b with a few ingredients on list 3 because of ocular irritation potential (e.g., alcohols). EPA normally regulates the presence of materials on list 3 by labeling to avoid contact

with eyes and to prohibit application by children. The other ingredients in the test formulations are commonly used in marketed products for application to human skin as components of cosmetic and drug formulations.

The insect repellent products proposed for registration have all been tested in animals for potential oral and dermal toxicity, dermal inhalation, ocular and dermal sensitization potential; studies on droplet size of spray and aerosol products showed that there was little if any potential for inhalation exposure. These studies will be submitted and reviewed by EPA as part of the registration process. The results of these tests showed a low order of toxicity characteristic of similar tests on the "neat" active ingredient cited by EPA in approvals of this product for application on humans. The IR3535 active ingredient has an extensive, positive safety record in consumer use.

MSDS documentation is the same as that submitted with the previous version of this protocol.

6.1.8 Test Material Composition and Stability:

The Test Material formulations are typical of topical cosmetics and insect repellent products marketed to consumers. They were produced under Good Manufacturing Practices (GMPs) with records available to EPA. Production of these insect repellents involves only simple mixing of the ingredients and does not involve chemical reactions that can be an issue with other pesticide products; ingredients are non-reactive as documented in storage stability studies that are required for submission to EPA as part of the registration process.

Test materials were produced in February 2006. They were couriered to Carroll-Loye Biological Research on 7 April 2006, with Chain-of-Custody documented. Since that time they have been stored at the Carroll-Loye Offices at in a closed cabinet at room temperature (20-24°C). The composition and content of active ingredients in the products used for the proposed efficacy studies will be confirmed by analytical methods prior to and following human subject efficacy testing. Storage stability testing is also being conducted. The EPA has extensive experience with enforcing requirements for such tests based upon their history with similar products applied to humans and EMD intends to provide any requested information as appropriate to safety and efficacy issues.

6.2. Negative Control:

6.2.1 Description of the Negative Control

The negative control is untreated for both dosimetry and repellency assays.

6.2.2 Rationale for Employing a Negative Control

Repellent efficacy can only be measured in the presence of biting mosquitoes. In addition, the duration of repellency recorded is likely a function of the number of host-seeking mosquitoes active during the study. The US/EPA uses a standard minimum rate of mosquito attack on untreated subjects to insure that the repellents under study are sufficiently challenged to provide meaningful data. Traditionally, the measure rate is termed the 'ambient biting pressure'. We adopt that value, but use LIBes ('Lites with Intent to Bite') rather than bites. A mean study LIBe rate of ≥ 1 LIBe per untreated (negative control) lower leg or lower arm per 1 minute is required.

We take several precautions to minimize the probability that untreated control subjects receive any bites (see §§ 5.4, 8.2, 8.3.1, 8.4.1, 10.3.6). Recognizing that individual subjects differ in their inherent attractiveness to mosquitoes, US/EPA science reviewers have recommended that we use two untreated control subjects for this study in order to improve the likelihood of sampling ambient biting pressure in a representative fashion, while still exposing a very small number of untreated subjects to risks from foraging mosquitoes. Having separate untreated subjects also avoids the problem of interaction between treated and untreated limbs that may arise when subjects serve as their own simultaneous controls. In reviewing an earlier version of this protocol in May 2006, the California Department of Pesticide Regulation asked for use of a single negative control, but compromised at two such subjects based on the position of the US/EPA. The prospect of receiving approval to use more untreated control subjects is probably small in this case.

There is no control in which each formulation matrix without the repellent active is tested. There is no a priori basis for anticipating significant repellent activity in the matrices, and the study objective is to examine efficacy of the end products. The question of whether there is interaction between matrix and active is external to that objective. Accordingly, the added risk of including additional subjects testing matrix-only formulations cannot be justified.

6.3 Test Arthropod Species:

Testing will be conducted with all or some of wild *Aedes vexans*, *Ochlerotatus melanimon, O. taeniorhynchus,* and *Culex pipiens* mosquitoes, and possibly other mosquito species that occur in the same habitats. Mosquito specimens will be collected from untreated control subjects during testing and identified in the laboratory using taxonomic keys and stereomicroscopy.

7 STUDY SCHEDULE:

7.1 Proposed Date of Initiation:

TBD, within one year of IRB approval.

7.2 Schedule of Events:

Test day	Date	Activities
-30– -2	TBD	Begin subject recruitment. Introduce subjects to test plan and procedures; explain compensation; review subject rights and consent forms; option to sign consent forms in order to participate; measure limb surface areas; determine individual dosage values.
1	TBD	Prepare individual dosages for application. Meet with subjects to review day plan and safety procedures. Travel to field site. Review safety and data collection procedures. Administer repellent, commence repellency data collection. Monitor subject safety, comfort, comportment, compliance with data collection protocol.

7.3 Proposed Date of Completion:

Experimental Completion Date (Test Day 1): TBD.
Final Report Completion Date: TBD.

8 STUDY DESIGN:

8.1 Treatment Groups:

There are two experimental groups, namely 1) a 'treated' group of subjects treated with the test products, of which there are three formulations , and 2) an untreated ('negative') control group.

8.2 Experimental Design:

The experiment will be treated as a partially randomized, experimenter and subject-blinded trial. However, control subjects will be chosen only from among individuals that are experienced in field biology or entomology. Whether arms, legs or both are tested at a given site will depend on the species of mosquitoes present and their behavior. That decision will be made by the Study Director based on visits to the field sites prior to data collection.

8.3 Randomization Procedures for Repellent Efficacy Testing:

8.3.1 Allocation of subjects to treatment groups:

Subjects will be assigned to the treatment (but not negative control) groups on the basis of a randomly assigned subject number. Subjects will be assigned a treatment based on their subject number and the treatment allocation table, which follows. Treatments will be balanced between arms and legs if both limbs are used. Negative control subjects will be selected exclusively from among experienced personnel.

8.3.2 Treatment allocation table:

Materials will be distributed among subjects as tabulated below. (Alternatively, pending consultation with US/EPA, the Pump and Aerosol treatments, which have the same concentration of the active ingredient and which will be very similar to one another after their carrying material evaporates, may be tested simultaneously on alternate limbs of the same subjects. Doing so would reduce the absolute subject exposure by 10 individuals. To preserve subject security from biting mosquitoes, limbs would be exposed one at a time.) Two personnel who will monitor ambient biting pressure with untreated limbs are also listed to clarify the design of the test.

Subject	Lotion	Pump	Aerosol	Untreated
1	Left limb			
2	Right limb			

3	Left limb			
4	Right limb			
5	Left limb			
6	Right limb			
7	Left limb			
8	Right limb			
9	Left limb			
10	Right limb			
11		Left limb		
12		Right limb		
13		Left limb		
14		Right limb		
15		Left limb		
16		Right limb		
17		Left limb		
18		Right limb		
19		Left limb		
20		Right limb		
21			Left limb	
22			Right limb	
23			Left limb	
24			Right limb	
25			Left limb	
26			Right limb	
27			Left limb	
28			Right limb	
29			Left limb	
30			Right limb	
31				Left limb
32				Right limb

8.4. Conditional Boundaries or Limits of Study

8.4.1. Ambient 'Lite with intent to bite' Pressure:

A mean study LIBe ('Lite with Intent to Bite') rate of ≥ 1 LIBe per untreated (negative control) lower leg or lower arm per 1 minute is required. No more than 10% '0' values for individual exposure periods are permitted. Ambient LIBe pressure is measured from continuous exposure during 1-minute exposure periods commencing once every 15 minutes, beginning at the onset of data collection. Negative control subjects are attended by two assistants who use mechanical aspirators to remove all mosquitoes that LIBe before biting commences.

8.5. Monitoring of Environmental Conditions During the Study

Records will be made of environmental conditions (temperature, relative humidity, wind speed, light intensity and precipitation (presence/absence and general rate/quality) at approximately one-hour intervals throughout the course of data collection.

9 STUDY PROCEDURES:

9.1 Test Subjects:

9.1.1 Inclusion criteria:

9.1.1.1	Age:	18-55 years
9.1.1.2	Sex:	Male/female
9.1.1.3	Race:	Any race
9.1.1.4	Written consent (see 9.4, below).	
9.1.1.5	Language:	Speak and read English

9.1.2 Exclusion criteria:

9.1.2.1	Known to be hypersensitive to mosquito bites or exhibiting hypersensitivity during test
9.1.2.2	Known to be sensitive or showing sensitivity to any of the test product ingredients after application.
9.1.2.3	Poor physical condition.
9.1.2.4	Unwilling to submit to brief query about personal condition.
9.1.2.5	Use of insect repellent within three days preceding the study.
9.1.2.6	Unwilling to refrain from use of perfumed products, alcoholic beverages or smoking after 9 PM the evening preceding the test and throughout the test.
9.1.2.7	Known to be pregnant or lactating. Pregnancy will be self-checked by each female volunteer on the morning of the repellent test using an OTC test kit provided by the Study Director. Results of each such test will be immediately verified by direct inspection by a female technician trained to make that assessment. Only volunteers scored as nonpregnant will be allowed to participate.
9.1.2.8	Inability to deliver the test materials to own left and right limbs.
9.1.2.9	Student or employee of the Study Director.
9.1.2.10	Do not regularly spend time in outdoor settings.

9.1.3 Number of Subjects and Rationale for Sample Sizes:

Dosimetry: 12 subjects per treatment formulation (namely lotion, pump spray, aerosol). Repellent efficacy: 10 subjects per treatment formulation and 2 untreated control subjects. Each subject is a replicate.

The number of subjects is chosen as a compromise between several conflicting factors. In the absence of clear means of estimating the distribution of outcome values, it is difficult to predict an ideal sample size. From a strictly scientific standpoint an appropriate response under such circumstances is to increase size, but ethical and economic considerations demand the opposite in the present study, particularly during the repellency phase.

The US/EPA has historically required a minimum of six subjects. Given that test repellents are nearly certain to exhibit greater than zero efficacy, and that testing is conducted under adequate ambient biting pressure, it is nearly certain that no untreated subjects will register fewer or later LIBes than any treated subjects. As a result, from the standpoint of statistical **power**, six treated and one untreated subject are sufficient to demonstrate a significant treatment effect at $P<0.05$. In the same vein, six is often regarded as a statistically sufficient sample for an observation subset because the increment in the confidence of means estimate begins to drop off sharply at that point. Notably, under the historical guidelines, there seem to have been few problems with EPA registering repellents that commonly fail to meet their labeled performance specification.

The main scientific risk of using a very small sample is that the probability of over-representing subjects inherently unattractive to mosquitoes is rather large. Note, however, that for US/EPA registration purposes, the test for mosquito repellency is conducted twice, once in each of two ecologically different habitats. In our experience, the subjects in one test normally do not participate in the other (due to large geographic distances between sites). In addition, two negative controls are used for a more robust baseline comparison. Those facts decrease the probability of such sampling error substantially.

However, further considerations indicate that a somewhat larger sample would be superior. Note that the draft EPA guidelines state that the response variable, 'Time to First Confirmed Bite' (or LIBe in this study) is calculated as the average duration for all treated subjects. There is no consideration of variation. In any given study, increasing the number of treated subjects to 10 will

improve the probability of estimating the population mean accurately.

The 95% confidence interval computation is useful for assessing the certainty of a means estimate, and for normal probability density function that interval is ±1.96 standard error of the mean. The normal density function is part of the exponential family of density functions, and in this study we anticipate that the distribution of Times to First Confirmed LIBe will be truncated toward the origin. However, available mean and variance data on IR3535 performance (Cilek et al. J. Amer. Mosq. Control Assoc. 20: 299-304, 2004) indicate that no individual values will be near zero. Using the rule of thumb that a distribution in which the mean is greater than three standard deviations above zero may be regarded as effectively normal, it is sensible to compute and report the normal 95% confidence interval in this study.

Employing eight subjects in a cage test, Cilek et al. (2004) recorded a mean protection time of approximately 180 minutes, with a standard error of about 15 minutes. Had their N been six, we can roughly predict that the 95% CI would be 148-212. At N=10, the estimate would be 155-205. At N= 20, the interval would be roughly 162-198. Evidently, adding the additional 10 subjects to reach an N of 20 shrinks the interval, in absolute terms, no more than did the addition of four subject to increase the sample size from 6 to 10.

To summarize, adding subjects beyond six increases the precision of the means estimate only slowly. However, the individual and public health importance of avoiding inaccuracy in this study, coupled with the fact that data collection is only 'replicated' once (in a different habitat at that), argues for a prudent approach. To reduce the risk of over-representing atypically attractive subjects, as well the weight of the value obtained from any one subject, we regard 10 (rather than six) treated subjects as a better sample size for the repellency portion of the study. For dosimetry, in contrast to repellency, less general information is available, and the risk profile is more benign. Consequently, a slightly larger sample is prudent. In meetings with EPA toxicology staff in 2005, 12 was regarded as an acceptably sample size for estimating mean dosage for each to the repellent formulations. Accordingly, we propose to employ a total of 12 subjects for dosimetry.

9.1.4 Test Subject Recruitment:

9.1.4.1 Synopsis of Recruitment Process:

i) Source(s): Participants are recruited by verbal networking through our academic and personal communities of friends, neighbors and scientists in Davis, California. Individuals are recruited from the community specifically for each study. Studies are not conducted with individuals from particular employers or agencies. Those who will serve as untreated control subjects are limited to experienced technical personnel, who are screened with the same exclusion criteria as are other subjects.
ii) Initial Contact Method: Initial contact is through word-of-mouth and telephone contact with individuals in our Volunteer Data Base.
iii) Follow up Contact Method: Telephone interview, personal interview with the Study Director conducted at the Carroll-Loye Biological Research Offices.

9.1.4.2 Methods of Recruitment:

Our subjects are mainly University of California–Davis graduate and undergraduate students in life science programs with which the Principal Investigator is associated. Students in his laboratory who depend on him directly for employment or scholastically are not eligible to participate. Other subjects are science, education and health care professionals, and mosquito and vector control professionals.

We contact subjects who participated in previous Carroll-Loye repellent efficacy tests by selecting them from our Volunteer Database. At that time, interested individuals often ask if one or more of their lab mates or acquaintances may participate as well. All such potential participants are screened or re-screened for suitability for each test in a private, one-on-one conversation held at the office of the Study Director. The Exclusion Criteria (section 9.1.2) are exercised by asking each candidate to address them in the interview with the Study Director. It is explained that pregnancy will be assessed directly on the test day. The Study Director encourages candidates to ask questions and ask for clarification at any time during the interview and in all activities that follow. To candidates that pass screening the Study Director describes the test purpose in plain language (in English), and the procedures and comportment to be followed are described in detail. Candidates are then asked if they would like to retire from consideration at that point. If they wish to remain in consideration, it is explained and emphasized that they may withdraw from the test at any time during the test without penalty to their compensation. This freedom is especially re-emphasized in cases in

which considerable effort or expense has been required to include a subject (e.g., air travel to a distant site), to discourage the conception that that effort or expense creates any added obligation in the subject. Candidates are given copies of the State of California Department of Pesticide Regulation 'Experimental Subjects' Bill of Rights' to read as the Study Director reads it aloud. They are also given a copy of the IRB-approved consent form to read as the Study Director reads it aloud. The amount and form of compensation is described. They are again encouraged to ask any questions they have about the test, which may include understanding its purpose more fully, understanding risks and discomforts more fully, and understanding treatment and compensation for injury more fully. While the majority of our subjects have worked with us on an occasional basis for a number of years, we encourage them to personally evaluate their interests and concerns about participation seriously each time. We ask them not to sign on immediately but to give the situation due consideration (normally at least one day, sometimes less for those who have participated in multiple prior studies). Because most of the volunteers are researchers and/or have advanced degrees in life sciences, we regard their motivations and decisions to participate as being unusually well considered and well informed. Accordingly, we normally accept their decisions to participate if they so choose following due consideration. Nonetheless, the Study Director retains the final right to refuse participation to any candidate.

9.1.5 Identification method and records retention:

Subjects will initially be identified by first and last name, and assigned a unique number for purposes of this study. Individual data will be entered into the computer for retention and analysis with reference to individual number, not name. Records relating individual names to individual numbers will be retained separately. The Study Director will retain records indefinitely. Subjects may obtain their own records from the Study Director.

9.1.6 Enrollment of alternate subjects and its relation to individual privacy:

We will enroll three more subjects than are required to meet our sample size. All subjects will be informed during the Consent process that on the day of testing, a small number of subjects may be designated as alternates and sent away after being compensated for coming to the test site. Alternate subjects may return later to replace subjects that initiate testing but withdraw before useful data are

generated. They also serve as insurance against any enrolled subjects who fail to appear.

The possibility that any subject may be designated as an alternate will assist in protecting the privacy of any subject that must withdraw in or near the presence of other subjects at the start of the test day (i.e., before treatment and testing begins), for reasons such as a positive pregnancy test result, or for any other personal circumstance to which possibly inappropriate attention might otherwise more readily be drawn. In the case of privacy concerns related to pregnancy detection, we regard this "indirect" approach as potentially as discrete and less likely to result in errors that would be the case if we were to employ, e.g., separate male and female Informed Consent Forms, with pregnancy only mentioned on the female form. The latter approach does not address loss of privacy among females, nor does it control the possibility of indiscrete revelation of pregnancy testing by females to males during the test or later, and it also creates the risk of a female subject using the wrong form. Separate forms would also assume that we may fairly treat individual subjects unequally on the basis of postulated gender-based differences in the information the merit receiving in to arrive at their informed consent decision. The soundness of making such an assumption enters ethically complex grounds requiring an intricacy of analysis and breadth of treatment beyond the scope appropriate to the privacy concerns of the present study.

9.2 Blinding of Study:

9.2.1. Extent of the Blinding:

The types of Test Materials and their identities will be evident to subjects as they apply them during the dosimetry portion of the study. During the repellency portion of the study, subjects will be blinded to the exact treatments they receive although some may note differences between the lotions and the clear liquids in the repellency potion of the study. The Study Director will be blinded to the identity of individual treatments until the conclusion of data evaluation.

9.2.2 Blinding Methods:

The Test Materials as well as the Dosing & Administration and Data Capture forms will be coded by a researcher with respect to treatment, so that subjects and personnel recording data will not be aware of the treatments for which they are reporting. The

Study Director will access the codes to identify the Test Materials in the Study Report after completing the data analysis.

9.3. Study Material Administration:

Study Materials will be administered to each subject by Carroll-Loye technicians. Test products will be applied volumetrically to the skin surface from a tuberculin (1 ml) syringe, and spread on the site as evenly as possible with two fingertips in a surgical glove, using a light rubbing motion. Skin surfaces to be treated are first cleansed with water and a fragrance free detergent soap, rinsed with a 50% ethanol in water solution, and then towel dried.

9.4 Subject Consent:

Written subject consent is an inclusion criterion.

9.5 Stop Rule and Medical Management:

Specific adverse reactions in subjects to the test materials are not anticipated based on low acute and chronic toxicity, as well as the research design to minimize exposures, and the training of subjects to aspirate landing mosquitoes before they probe or bite. Because the products are topical, technical personnel will monitor, and subjects will self-monitor, for allergic and irritant skin reactions, particularly redness, edema, itching or pain, and report any such reactions to the Study Director. Any subject showing adverse skin reactions will immediately stop further participation. The treated skin will be gently washed with clean water and mild soap to remove the test product, and the area will be gently dried with a clean towel. The subject will be removed from further exposure to mosquitoes.

On the day of testing, a physician who has read the protocol and discussed the research with the Study Director will be on call. In unlikely event of a Type 1 allergic reaction (anaphylaxis), we will contact 9-1-1 by cellular or satellite telephone and cooperate as instructed with emergency personnel. We will be prepared to instruct emergency personnel on how to reach our site via multiple routes. In addition, we will personally transport affected persons to the nearest hospital if so advised by emergency personnel. There is sufficient redundancy in personnel that in such a case subjects remaining at the study site will still receive appropriate technical, scientific and safety guidance.

All subjects are asked to contact the Study Director and a physician of their own choice at any time should they develop a rash (a delayed hypersensitivity reaction) within 48 hours of the conclusion of the test day.

The risk of mosquito-associated health risks is likewise regarded as very low due to the complementary precautions outlined herein. However, the Study Director will assess skin condition of affected subjects should any bites inadvertently occur during efficacy testing. In addition, subjects will be asked to make contact with Study Director at any time should they have health concerns relating to their participation in the efficacy testing.

As part of Medical Management, the Study Director will record all benign and adverse health observations.

9.6 Subject training for research with mosquitoes

Approximately one week to four days before repellent efficacy testing, subjects will be trained by technical personnel in handling mechanical aspirators and observing mosquitoes in the laboratory. Subjects will be shown how to turn on and manipulate the aspirator to capture mosquitoes by a technician who first demonstrates the following procedure, which subjects then emulate: Two laboratory-reared, disease-free female mosquitoes are released in a cage. A small area (less than _ of the forearm) is uncovered and exposed in the cage, with no insect repellent applied. Subjects will learn how to watch approach and land on the arm, how to detect a mosquito's intention to bite, and how to quickly remove LIBing mosquitoes with the aspirator. A technician will be present to instruct and guide throughout; mosquitoes will not be exposed to more than one subject before being destroyed. This 'hands-on' experience will assist subjects in collecting data accurately and handling mosquitoes safely during the repellent efficacy trial.

10 TEST VARIABLES AND THEIR MEASUREMENT:

10.1 Variables to be Measured:

Subject forearm and lower leg surface area.
Subject self-dosing behaviors.
Weight of test materials delivered to the surrogate skin (gauze) dosimeters.
Number of mosquito lites with intent to bite (LIBes) on the treated surface.

10.2 When Variable will be Assessed:

Dosage will be calculated on the basis of surface area of the lower limb skin that is treated. Measurements to calculate that surface area will be made on each subject in advance of application of the test materials.

Self-dosing behavior (distance of spray nozzles from skin, number of pumps or sweeps of delivery apparatus) will be measured at least three days prior to Test Day 1.

Passive dosimeters (described in section 10.1.3) will be weighed before application of the test materials and again between one and five minutes after application of the test materials.

Subjects will record any 'lites with intent to bite' (LIBes) as they occur. Data are recorded in one-minute exposures at 15 minute intervals. The time at which the application of a treatment is completed is recorded as t_0 ('time zero'). Subjects will practice removing mosquitoes exhibiting LIBes before the field test.

10.3 Procedures for Assessing Variable:

10.3.1 Limb dimensions and surface area:

The term 'limb' refers to the forearm and the lower leg. The surface area of each limb is computed as the average of four evenly spaced circumferences (two peripheral, two central) of the forearm (elbow to wrist) or lower leg (back of knee to ankle) multiplied by the length of treatment area.

10.3.2 Familiarization with, and subject use, of each spray apparatus:

Variable assessment will involve a two-step process, namely subject familiarization with the spray apparati, followed by dosage measurement.

Subjects will practice application of test materials to their own limbs under the following procedure (next paragraph), which will be reviewed for the subjects by a researcher before practice commences. The copies used during the study will be formatted for greater clarity and ease of use than is possible here.

"Read along on your copy of the procedure as the Researcher reads them to you. Ask questions of the Researcher as they occur to you or at any time thereafter. Be sure to get answers to any questions you feel should be answered before proceeding at any step of this work.

This is a study of your behavior in applying spray insect repellents. You will probably have had experience with applying spray products of some kind to your skin before. If you are uncertain about how to use a spray dispenser be sure to ask the Researcher or one of the technicians. You will each have the opportunity to practice these procedures with the aid of a technician.

Insect repellents function to repel insects from biting the skin. Their effectiveness is influenced by the completeness of their application to the skin surface. Our goal is to determine your preferred method for achieving **full coverage**. At minimum, **full coverage** is defined as a continuous and complete layer of test material. Orienting the arm to light may aid in determining whether full coverage has been achieved. Spray as much as necessary to achieve full coverage.

In these instructions, the act of spraying a repellent on your arm will be termed 'spraying', 'application', or 'dispensing.'

If you are wearing a long-sleeved shirt roll the sleeves so as to expose the entire lower arm. Wash arms thoroughly with the provided cleanser and dry with a clean towel. Place new latex or vinyl gloves on each hand, choosing the size that fits you most snugly without being uncomfortably restricting or likely to tear when you put them on.

You will work with a technician who will assist you in measuring and recording your use of a repellent product in two delivery systems, a pump spray and an aerosol spray.

Work first with the pump spray, second with the aerosol spray. Because they are similar, the application instructions below describe the procedures for each type of spray together in each paragraph.

Familiarize yourself with the spray mechanism. Any actuation (pushing down on the pump plunger) of the spray must take place out-of-doors. Work at a distance of no less than 6 feet (1.9 meters) from other subjects. Do not dispense the spray at or near your face or anyone else's. Minimize inhalation of airborne spray while working.

Testing will take place out-of-doors during daylight hours at an air temperature (shade) above 14 °C (57 °F) and wind speed below 12 kph (7 mph), with no precipitation. The researcher or a

technician will inform you when these conditions are not met and spraying of the repellents will cease until those conditions resume.

Dispense the spray on one forearm, using the opposite hand. By successively moving the spray nozzle closer to and farther from the arm, identify a distance between nozzle and skin that seems most appropriate for effective application to the skin. The technician will measure and record that distance to the nearest centimeter on the provided datasheet.

Wash and dry the treated arm so that none of the repellent you have applied is visible on close inspection.

Now, using the spray nozzle at or near the distance from the skin that you have just chosen to be effective for application, determine the minimum number of actuations (pumps of the pump spray) or longitudinal passes (aerosol) required to give full coverage of all surfaces of the forearm. For the pump spray, depress the plunger fully each time, and count them aloud beginning with "1, 2, 3 ...." etc. Report the count to the technician who will record it on the data sheet.

When applying the aerosol, announce each onset of spraying with the word "START" and each cessation with the word "STOP". This will aid the technician who is counting your application time. Apply the aerosol in a series of full "sweeps" (passes) between the wrist and elbow. There may be more than one start and stop while working to achieve full coverage of the arm. Count each one-way sweep as one sweep, and count passes in a manner analogous to that used for pump spray (above). If you make a partial sweep that you judge to be closer to a "half sweep" than a "full sweep", call it out to the technician as a "half". Try not to let your awareness of the technician's timing influence your dispensing behavior. If the technique of using mainly full sweeps seems awkward or unnatural to you, inform the technician immediately. Your preferred method should be demonstrated for the Researcher, who will determine how it may be quantified.

Repeat the application procedure and collect the same data for the other arm.

Discard your latex gloves, and wash both arms with cleanser and dry them thoroughly with a towel.

Put on new gloves, and repeat the application procedure (both arms) with the pump spray. The technician will again measure your preferred distance between the nozzle and the skin, and

quantify the application as before. Try to be consistent with your use of the spray apparatus. If you are clear and confident about the distance from the arm that works best, pay enough attention to keep the nozzle in that general range while maintaining a natural delivery as you would use the product under normal personal use. Keep the nozzle aimed at the skin surface, and avoid orienting the containers in ways that seem to interfere with delivery of the repellent to the skin surface.

Now move onto the **Spray Sampling** exercise described in the next section for the spray pump. After completing that exercise, you will return to the instructions above that you have just carried out and conduct the procedure for the lower legs, and then conduct Spray Sampling for the legs. Next repeat all of the above with the aerosol."

10.3.3. Spray Sampling

Spray Sampling is the procedure by which the spray is subsampled with patch dosimeters. Dosimeters of known surface area will be placed on subject lower arms. These dosimeters will intercept a portion of the spray applied to the arm. Be weighing dosimetry patches before and after treatment, the mass of the intercepted material can be calculated. The spray delivery systems will also be weighed before and after each application.

Spray sampling will be conducted according to the following procedure.

"Please read along with the Study Director as he reads aloud the following description of the procedures you will employ in spray sampling. Please be sure to ask questions at any point.

This procedure is very similar to what you have just performed. The main difference is that for spray sampling, a technician will place four narrow rings of plastic-backed gauze around each of your forearms. The rings are about one-inch (2.5 cm) wide. Each of these "gauze bracelets" will be centered on each of the four positions on the arm at which we initially measured the circumference.

The function of the "gauze bracelets" is to capture some of the spray that would otherwise reach your arm as you apply the test products. It is important that you do not alter the way in which you apply the materials in any intentional or substantial way from what you have already determined is your best procedure. The technician will review your results from your previous applications

with you to assist you in repeating your general procedure (distance of nozzle to skin, number of spray pumps or aerosol sweeps) as you apply the materials to one of your arms with the bracelets in place.

The gauze bracelets are narrow in order to minimize the extent to which your sensation of receiving the spray on the arm is changed. Do your best to proceed as if the sensation is not changed. In other words, attempt to avoid spraying additional material onto areas under the bracelets where the sensation of test material on the skin will be different or absent. Do not attempt to spray additional material directly onto a bracelet unless it is within an area that needs additional treatment. Again, attempt to repeat the procedure that you have already developed, and apply the materials "as if the bracelets were not there."

Put a new latex glove on each hand. Spray material onto one arm only. The technician will tell you to which arm to apply spray. You and the technician will collect the same data as previously.

After you have completed spraying, keep both arms from making contact with any surface. All bracelets will be removed by a technician and taken for weighing.

Discard your gloves, and wash both arms with cleanser and dry them thoroughly with a towel.

Repeat these procedures until you have made at total of three spray samples for the first arm, and three more for the second arm. Be sure to discard your gloves, and wash both arms with cleanser and dry them thoroughly with a towel, including after the last application."

10.3.4. Lotion sampling

The amount of lotion applied to limbs will be quantified in a series of three applications analogous to the Spray Sampling above. However, dosimeters are not required, nor are the extensive practice sessions. The amount applied is the weight difference in the dispensing tube before and after application.

The instructions are as follows:

"Put a new latex glove on each hand. You will apply lotion to one arm only. The technician will tell you to which arm to apply. You will begin with an amount that you suppose is about one half of

what you will need to achieve thorough and uniform coverage. After spreading that around the lower part of your arm, you will apply more as needed to the area closer to your elbow. Begin by gently squeezing lotion from a tube with the cap open directly onto the horizontally-held surface of the opposite arm. Hand the tube to the technician. Using the tips of the index and middle fingers, spread the lotion as evenly as possible on all surfaces of the lower arm. Do not spread it onto the hand or beyond the marking on your wrist. If you have sufficient lotion left to spread it evenly and thoroughly toward the elbow, continue in the direction. Do not spread it beyond the elbow or past beyond the marking near the elbow. If you need more lotion to achieve thorough and even coverage, make sure you have wiped all repellent from your fingertips onto the skin and ask the technician to hand you the tube. Apply as much additional as you think you need, as before, but to complete the coverage. If you decide that you have applied more repellent that you would normally use to achieve thorough and even coverage, immediately have the technician wash and dry the treated arm so that none of the repellent you have applied is visible on close inspection, and begin again. Likewise, be careful to avoid dropping any lotion off of the arm, and if this happens, begin again as you would if you applied too much.

After you have completed an application successfully, the technician wash and dry the treated arm so that none of the repellent you have applied is visible on close inspection, and reweigh the tube. You will continue until you have completed three successful applications. Then you will repeat the entire procedure above, but with the lower leg."

10.3.5 Equipment Used to Assess the Dosimetry Variable:

Passive dosimeters are 2.5 cm wide strips of 3M Brand Nexcare™ Holdfast™ self-adhesive roll gauze.

There will be eight bracelets per replicate. Each arm and leg will be treated three times. Each subject will therefore use a total of forty-eight bracelets.

Bracelets will be weighed before and after treatment on a traceably calibrated Sartorius H51 balance (measurement increment 0.0001 g, 30 g capacity). Test material containers will be weighed before and after dispensing on a traceably calibrated Sartorius GC 2502 (measurement increment 0.001 g, 500 g capacity).

10.3.6. Repellency and LIBes:

Repellency is assessed in the field. Preparatory training of the subjects to recognize and remove mosquitoes that lite with intent to bite contributes to subject safety. Subject safety is also enhanced by brief periods of exposure at intervals. as well as careful dosing and application.

Subjects will have approximately one hour of training and practicing observing foraging mosquitoes and catching them from their own arms in a laboratory cage, using an aspirator. A researcher will first demonstrate the procedure using his or her own arms, and will be present to instruct and guide each subject throughout the exercise. Subjects will be shown how to place both arms in a screen cage and to turn on the aspirator using the switch on the handle. One mosquito will be released in the cage. A small area (less than one-half of the forearm) will be uncovered, with no insect repellent applied. Subjects will be instructed to carefully watch the mosquito as it flies in the cage. The subject will be instructed to carefully observe the mosquito as it lands on the skin, and to watch to see if its needle-like mouths are placed against the skin. Once a mosquito lands on the skin, places it mouth against the skin and stops walking, subjects will immediately attempt to catch the mosquito in the plastic nozzle of the mosquito catcher. They may practice as many times as they wish with additional mosquitoes, and the researcher will be certain that the use of the mosquito catcher is correct. After several captures of single mosquitoes, a maximum of two mosquitoes will be placed in the cage. Two LIBing mosquitoes may be readily captured after little practice. Two represents the maximum number of mosquitoes that may LIBe on limb before the exposure stopping rule is reached (below), and so the exercise in the cage with two mosquitoes is highly appropriate.

The mosquitoes used for this training are *Aedes aegypti* reared in the laboratory and free from diseases. The source colony of *Aedes aegypti* was established from eggs collected in Northern Thailand in 2004. F_1 adults were tested by Vero cell (African green monkey kidney, *Cercopithecus aethiops*) plaque assay for possible transovarial infection of viruses. Typically, 20 females from subsequent generations are tested routinely, and no infection has been detected in the 2 years since this colony was established. A sample of 20 such females will be so tested before being employed in this study. Individual mosquitoes will not be used for more than one subject.

At the field site, the subjects and researchers will gather in an area without biting mosquitoes. Subjects are instructed not leave this area until guided by a researcher.

The technicians and other researchers who will assist subjects during the test will be introduced or reintroduced to the subjects. Subjects are instructed to call on them whenever they have questions. Each subject is given and must wear a head net, fabric coveralls, latex, nitrile or vinyl gloves in their size, and is given an aspirator to suck any mosquitoes that land on treated skin and attempt to bite (LIBes) once formal exposures begin. A researcher will remind subjects about how to identify LIBes and when and how to operate the aspirator. Subjects will be further instructed about protecting themselves from mosquito bites during the test, and reporting on a mosquito that lands on skin treated with repellent.

Before the repellent is applied, subjects will be guided to wash the lower arms and/or legs with mild, low fragrance soap, rinsing them with a spray of ethyl alcohol (mixed with an equal part of water), and then drying them with a clean towel. A technician will then apply insect repellents to their forearms or lower legs to give even, complete coverage of the skin. The amount of repellent to be applied to any limb will be calculated in advance for each subject. The dosing rate will be the product of the subject's limb surface area multiplied by the grand mean (mean of subject means) rate calculated in the dosimetry data analysis for that test material. Each subject will therefore be dosed at the same rate within a given repellent even if their individual application rates differed from the grand mean.

Treated subjects will be partnered into groups of two. A researcher will then guide subjects into the area of the field site in which mosquitoes are active, approximately 15 minutes after the test materials are applied. Each member of a partner pair will watch their own exposed limbs and those of their partner for mosquitoes that land for one minute. A technician will advise subjects when the one-minute period begins and ends. Subjects will immediately remove any LIBing mosquitoes from the skin with repellent with the aspirator. They may also use the plastic nozzle of the aspirator or a finger to interrupt any mosquito even more quickly.

At the end of the one-minute exposure period, subjects move away from the area with mosquito activity. Partners will assist one another in covering the treated skin with the sleeve of the

protective garments. Each subject will report the number of mosquitoes that attempted to bite their own treated skin during that one-minute period when asked by a technician who will record it on a data sheet. For perspective, note that in a typical test of a reasonably effective repellent, dozens of '0' LIBe values will be recorded for each '1' or '2'. In other words, during most exposure periods subjects do not experience close contact with mosquitoes.

Stopping Rule: Subjects are instructed to immediately cover exposed skin with the protective garment provided if more than one LIBe occurs in a one-minute exposure period or in either of the two previous exposure periods (i.e., two LIBEs in any three consecutive periods, meaning that a confirming bite attempt occurs within one half hour of a prior attempt). Subjects and data recording technicians monitor the temporal pattern of LIBes together.

Ambient LIBe pressure will be measured by experienced, untreated personnel from continuous exposure of a single limb during 1-minute periods commencing once every 15 minutes, beginning at the onset of data collection. Such negative control subjects are attended by two assistants who use mechanical aspirators switched on throughout the period to remove all mosquitoes that LIBe before biting commences. If mosquitoes are too abundant to permit ready aspiration, the controls may protect the exposed limb as soon as a LIBe occurs.

10.3.7 Forms for Retention of Source Data:

Dosimety data will be recorded on data form for each test material formulation. 'Lite with intent to bite' (LIBe) data will be recorded on a repellency data form. Data forms are appended.

10.4 Study Facility:

Dosimetry data collection will take place in the main building and on the terrace of Carroll-Loye Biological Research.

11 DATA ANALYSIS:

11.1 Experimental Unit:

The individual subject will be the experimental unit.

11.2 Replicates per Treatment:

For dosimetry, there will be 12 treated subjects, each serving as their own untreated control, testing each of the three repellent formulations. For repellency testing, there will be 10 subjects treated with each test repellent and two serving as untreated controls for repellency testing at each of two sites.

11.3 Statistical Methodology:

Statistics will be computed with the software 'SAS JMP' Version 5.0.1.2 (SAS Institute, Cary, NC).

11.3.1 Dosimetry:

Dosage will be calculated per square centimeter of skin. The amount of test material delivered to each dosimeter in each trial will be calculated as:

weight after application – weight before application

The **total captured** by all treated dosimeters per trial will be calculated by adding the mass changes in all four dosimeters together, and then subtracting or adding, respectively, any total gain or loss of weight in the paired control dosimeters.

The **proportion covered** of the total limb surface area by the dosimeters is:

$$\frac{\text{Surface area of a set of 4 dosimeters}}{\text{Surface area of the limb}}$$

The estimated **dosage per trial** is:
Total captured x 1/**proportion covered**

The specific gravity of each test material will be measured and used to convert the dosage weight data to volumes for preparing individual subject doses volumetrically for dispensing from the tuberculin syringes.

Subject means and standard deviations will be calculated for all measures of dosimeter weight changes as well as application

behaviors (distance from nozzle to skin, duration of application, number of sweeps/pumps). Lotion, pump spray and aerosol statistics will be calculated separately and then compared with nonparametric tests for two- and three- sample independent cases (Wilcoxon match-pairs signed-rank and Kruskal-Wallis tests, respectively).

We will statistically assess the strength of any individual subject differences in application behavior and dosing in interaction with the three test materials using Friedman two-way analysis of variance subject dose means for each test material. We will use subject dose means for each test material to calculate dosing grand means (± SD) for each test material. Those means, expressed as repellent weight per unit skin surface area, will be used to determine individual subject doses in the field repellency test.

11.3.2. Repellency:

Field tests are conducted with large populations of arthropods. This permits the analysis of the replicates (data by subject) as independent values. The hypothesis that the test materials will significantly reduce the number of mosquitoes LIBing on treated versus untreated skin is not the focus of this study. The focus is to compute, for each test material, a reasonable estimate of mean and standard deviation for the duration between application and sufficient repellency breakdown such that two mosquitoes LIBe on a subject within a half hour period. That pattern is here assessed at a resolution of 15 minutes. The untreated limbs serve to monitor whether the ambient biting pressure remains at or above the EPA standard.

Complete protection time (CPT) is measured as the length of time from initial application to the first confirmed LIBe. A confirmed LIBe is a LIBe followed by another LIBe within 30 minutes. For example, a LIBe at 90 minutes followed by another at 135 minutes is not confirmed, but a third LIBe at 150 minutes would confirm that at 135 minutes, giving a CPT of 135 minutes.

CPT measured in this way will yield a single time value for each subject. Mean CPT will be calculated across all 10 subjects per treatment, and will be presented with standard deviation and 95% confidence interval information as well. Ambient LIBing pressure as measured by the technical personnel serving as untreated controls will be presented tabulated by individual and exposure period. Mean LIBing pressure will be calculated as the number of

LIBes received per untreated control subject and per period and span of exposure.

12 STUDY LOCATION(S):

Field sites are in or adjacent to the Central Valley of California, and the Florida Keys (depending on season). Test site information will be furnished to EPA once it is clear when testing will be permitted, since season influences the availability of test arthropods on both regional and local scales.

13 QUALITY ASSURANCE:

An independent, professional Quality Assurance Unit (QAU) will inspect the study. The QAU will report to the Study Director. Protocol Review and Comments must take place before data collection commences. In-Life Inspection must include observing the measurement and recording of key variables by subjects and researchers. In addition, the Final Report will be audited for completeness and accuracy. A QAU Statement will address compliance and noncompliance or any omissions in auditing. Findings from the In-Life Inspection and the Final Report, as well as the QAU Statement will be transmitted to both the Study Director and to the Sponsor Monitor.

14 PERSONNEL:

14.1 Investigator (Study Director):

14.1.1 Address:

Dr. Scott Carroll
Carroll—Loye Biological Research
711 Oak Avenue
Davis, CA 95616

14.1.2 Telephone:

530-297-6080
530-297-6081 (Facsimile)

14.1.3 Training and experience of investigator:

CV on file with sponsor

14.2 Study Monitor:

Dan Giambattisto

14.2.1 Address:

EMD Chemicals, Inc.
7 Skyline Drive
Rona–Cosmetic Business Unit
Hawthorne, NY 10532 USA

14.3 Quality Assurance Unit:

Dr. Jenella Loye

14.3.1 Address:

Carroll—Loye Biological Research
711 Oak Avenue
Davis, CA 95616

14.3.2 Telephone:

530-297-6080
530-297-6081 (Facsimile)

14.1.3 Training and experience of QAU:

CV on file with sponsor

15 AMENDMENT/DEVIATIONS TO THE PROTOCOL:

Protocol amendments or deviations will be reviewed by the Study Monitor and the Study Director. Any changes that may affect the health or safety of study participants must be approved the Study Director, the State of California Department of Pesticide Regulation, and the approving IRB. The amendments, deviations as well as any adverse events will be documented in the Study Director's final report. Documentation will include a description of the change, the reason for the change and the effect of the change on the conduct and outcome of the study.

16 PROTOCOL APPROVAL SIGNATURES:

1 November 2006

Scott P. Carroll, Ph.D.
Study Director

Date

1 November 2006

Study Monitor or Monitor's Agent
Dan Giambattisto, EMD Chemicals, Inc.

Date

Appendix 1. Test repellent formulations.

Insect Repellent Spray with IR3535®
(EUS26-15)

Ingredients	INCI	[%]	CAS No.	EPA Inert List
Phase A				
IR3535®	Ethyl Butylacetylamino-propionate	20.00	52304-36-6	**Active Ingredient**
Carbowax 400 /Union Carbide	Polyethylene glycol 400	5.00	25322-68-3	4B
Arlamol E	PEG-15 Stearyl Ether	1.00	25231-21-4	4B
Phase B				
Ethanol SD 40B	Denatured Alcohol	35.00	61116-08-3	4B
Carbowax 1450 /Union Carbide	Polyethylene glycol 1500	4.00	25322-68-3	4B
PVP/VA Copolymer E-735 /ISP	PVP/VA copolymer	2.00	25086-89-9 64-17-5	
Polysorbate 20 / Uniquema	Tween 20	1.50	9005-64-5	4B
Water, demineralized	Aqua (Water)	31.50	7732-18-5	4A

Insect Repellent Aerosol with IR3535®
(EUS26-16)

Ingredients	INCI	[%]	CAS No.	EPA Inert List
Phase A				
IR3535®	Ethyl Butylacetylamino-propionate	20.00	52304-36-6	**Active Ingredient**
Phase B				
Ethanol SD 40B	Denatured Alcohol	21.67	61116-08-3	4B
Propylene glycol / Union carbide	Propylene glycol	4.34	57-55-6	
PVP/VA Copolymer E-735 /ISP	PVP/VA copolymer	1.73	25086-89-9 64-17-5	
Water, demineralized	Aqua (Water)	17.26	7732-18-5	4A
Phase C				
A31, Isobutane /Aeropres	Isobutane	35.00	75-28-5	

Insect Repellent Lotion with IR3535®
(WV29-01)

Ingredient	INCI	(%)
PHASE A		
Water, demineralized	AQUA (WATER)	ad 100
1,3-Butanediol (Merck KGaA)	BUTYLENE GLYCOL	4.00
Titriplex® III (Merck KGaA)	DISODIUM EDTA	0.10
PHASE B1		
Rhodicare-S (Rhodia GmbH)	XANTHAN GUM	0.20
Carbopol ETD 2050 (Noveon)	CARBOMER	0.30
PHASE B2		
Triethanolamine (Merck KGaA)	TRIETHANOLAMINE	0.20
PHASE C		
Arlacel 165 VP (Uniquema)	GLYCERYL STEARATE, PEG-100 STEARATE	3.50
Dow Corning 200 (100cs) (Dow Corning)	DIMETHICONE	0.50
Isopropyl palmitate (Cognis)	ISOPROPYL PALMITATE	4.00
Lanette 16 (Cognis)	CETYL ALCOHOL	1.00
Crodamol STS (Croda)	PPG-3 BENZYL ETHER MYRISTATE	2.00
IR3535®	**ETHYL BUTYLACETYLAMINOPROPIONATE**	**10.00**
Stearic acid (Merck KGaA)	STEARIC ACID	2.00
PHASE D		
Selbel 305 (Seppic)	LAURETH-7, POLYACRYLAMIDE, C13-14 ISOPARAFFIN	1.00
PHASE E		
Triethanolamine (Merck KGaA)	TRIETHANOLAMINE	0.10
PHASE F		
Paragon II/McIntyre	PROPYLENE GLYCOL, DMDM HYDANTOIN, METHYLPARABEN, PROPYLPARABEN	1.00

Appendix 2. Sample data recording forms.

Repellency. A simple grid with 10 subject rows, and approximately 32 columns for 8 hours of sampling at 15 minute intervals will be used.

Appendix. Data sheets (arm, rather than leg, examples are given).

Pump Spray Application

Subject name: Subject number

Date:

I. Quantification of application behavior

A. Left arm

Trial no.	Distance from skin	No. of pumps for full coverage	Mass before	Mass after
1		X	X	X
2				
3				
4				

B. Right arm

Trial no.	Distance from skin	No. of pumps for full coverage	Mass before	Mass after
1		X	X	X
2				
3				
4				

II. Spray sampling

A. Left arm

Trial no.	Distance from skin	No. of pumps for full coverage	Mass before	Mass after
1				
2				
3				

B. Right arm

Trial no.	Distance from skin	No. of pumps for full coverage	Mass before	Mass after
1				
2				
3				

Aerosol Application

Subject name: Subject number

Date:

I. Quantification of application behavior

A. Left arm

Trial no.	Distance from skin	No. of sweeps for full coverage	Seconds sprayed	Mass before	Mass after
1		X	X	X	X
2					
3					
4					

B. Right arm

Trial no.	Distance from skin	No. of sweeps for full coverage	Seconds sprayed	Mass before	Mass after
1		X	X	X	X
2					
3					
4					

II. Spray sampling

A. Left arm

Trial no.	Distance from skin	No. of sweeps for full coverage	Seconds sprayed	Mass before	Mass after
1					
2					
3					

B. Right arm

Trial no.	Distance from skin	No. of sweeps for full coverage	Seconds sprayed	Mass before	Mass after
1					
2					
3					

Lotion Application

Subject name: Subject number

Date:

A. Left arm

Trial no.	Mass before	Mass after
1		
2		
3		

B. Right arm

Trial no.	Mass before	Mass after
1		
2		
3		

Appendix 3. IRB Approval Letter and Informed Consent Form

INDEPENDENT
INVESTIGATIONAL
REVIEW BOARD INC.
Your Advocate for Clinical Research Participants

DATE: November 01, 2006

TO: Scott P. Carroll, PhD
Principal Investigator

FROM: Kim Lerner, Chairman or
Anita McSharry, Vice-Chairman
Independent Investigational Review Board, Inc.

SUBJECT: Site Letter dated 10/30/2006
- Revised Informed Consent Form (Ver. 11/1/2006)

PROTOCOL: EMD-004

The Independent Investigational Review Board, Inc. (Vice Chairman) had an opportunity to review the Site Letter and the revised Informed Consent Form for the above noted research study. The site letter referred to an email submission of Informed Consent Form changes suggested by the FDA.

The Site Letter is approved as submitted. The revised Informed Consent Form is approved. The Informed Consent Form has been revised to accommodate the Site Letter. The approved revised Informed Consent Form is identified as Version 10/24/2006 and stamped, "Approved 11/1/2006". All current subjects and future volunteers must sign the revised consent form.

Thank you for your cooperation.

KL/AMS/rr/yc:fc

phone 954-327-0778 • fax 954-327-5778 • 6738 West Sunrise Blvd., Suite 102 • Plantation, FL 33313 • info@iirb.com (email) • www.iirb.com

INFORMED CONSENT AUTHORIZATION TO PARTICIPATE AS A RESEARCH STUDY SUBJECT

Title of Study: (EMD-004) Test of Personal Insect Repellents

Principal Investigator: Scott P. Carroll, Ph.D.

Site of Investigation: _____
_____
_____

Sponsor: EMD Chemicals, Inc.

Participant's Name: _____

You are being asked to participate in a research study. Your participation is voluntary. The information in this Informed Consent Form explains the study. You will receive a copy of this form, and you may take it home and think about it before making your decision. If you have any questions, or do not understand anything in this form, please ask the Principal Investigator to explain any words or information you do not clearly understand.

NATURE AND PURPOSE

Carroll-Loye Biological Research is conducting this research study in order to develop effective mosquito repellents. Many people are interested in having new and better insect repellents available to them. The insect repellents that we will study were developed from amino acids that are naturally occurring substances in animals. More studies are needed to determine how well such new insect repellents work.

The purpose of the study is to test how well new lotion, pump spray and aerosol insect repellent products work outdoors against mosquitoes. These three products, which are similar to some already being sold, have been formulated to be more cosmetically acceptable to users. The repellent ingredient is a biochemical called 'IR3535'. The information gained from the study will assist in the development of these repellents for future commercial marketing. During the study we will first measure how much insect repellent you put on your own arms and legs in a visit to the study laboratory, and train you to use a mechanical mosquito catcher. On a later date, we will go to a field site to test the insect repellents against mosquitoes in nature.

The sponsor, EMD Chemicals, Inc. has contracted Carroll-Loye Biological Research to conduct the study. Scott Carroll, Ph.D., of Carroll-Loye Biological Research is the Principal Investigator in charge of the study.

Version : 10/24/06
Protocol: EMD-004

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

SUBJECT SELECTION

You have been offered an opportunity to participate in this research study because you read and speak English, consider yourself to be in good physical condition and are 18-55 years of age. If you are a female of child bearing potential you cannot be pregnant or breastfeeding.

Approximately 30 volunteers will be enrolled in this field research study. A few more subjects will be enrolled than are needed in order to make up for anyone who is unexpectedly unable to participate once testing begins. If more subjects are present than are needed for any part of the test, you may be asked not to participate, but will instead be an 'alternate subject' who may be contacted to participate later if needed. If you are designated as an alternate subject, you will be compensated for your participation up to that point and for your inconvenience.

STUDY INTRODUCTION AND DURATION

Schedule of visits and time required to participate in the study

Activity	Visit 1 (1-21 days before the field test)	Visit 2
1. Orientation and Dosage visit	X	
2. Field study visit		X
Total time	2-3 hours	8-14 hours

You will be given a training manual and will have a chance to review it and to read along with the instructions.

Visit 1 for Orientation and determining Dosage

Within 21 days before the field study visit you will go to the laboratory and meet with a researcher to perform introductory activities for the repellent study. The researcher will also tell you more about what you will experience while participating and what is expected of you. You will work with a researcher to determine how much insect repellent you apply. Completing those measurements will take 1.5-2.0 hours.

You will also be shown how to use a handheld mosquito catching device called an aspirator. These devices resemble flashlights except that they have a small electric fan and suction tube rather than a light bulb. You will carry one of these devices with you during the field study. During this visit you will also practice removing mosquitoes from a small area of your arm with the aspirator. This training and practice will take about ½ to 1 hour.

The total time for Visit 1 activities will be about 2-3 hours.

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

Visit 2 for the Field Test against Mosquitoes

The study will also require one visit to the site of the field study. The field site visit will most likely require approximately 10 hours of your time. However, it may require as few as 8 hours (including travel time) and as many as about 14 hours, depending on how long the repellents remain effective. Bathrooms are available, and meals, drinks and snacks will be provided. There is a small chance that weather conditions will require that the test be canceled or rescheduled. The Principal Investigator will inform you in a timely manner if that happens.

STUDY PROCEDURES

Study Design

The study will test three different insect repellent products, namely a lotion, a pump spray and an aerosol spray. You will be randomly (by chance) assigned to receive one or two of the three products, so your chance of receiving any one of them is one-in-three or two-in-three. You will not have a choice as to which repellent product or products you receive. For each product assigned to you, you will have an amount typical of what people commonly use applied to your forearms or lower legs. Experienced personnel will also be present to record the activity of mosquitoes by exposing their own arms or legs without repellent applied. However, you will not be asked to expose untreated skin and should avoid doing so.

If you are a female, you will perform a pregnancy test using an Over the Counter (OTC) pregnancy kit in the morning prior to the start of each of the two study visits. The results of your test will be verified by a female technician that is qualified to make that determination. If you are pregnant, you will not be allowed to participate in the study. Information regarding your pregnancy test results will be kept in confidence.

Procedures

Visit 1

At the laboratory, a researcher will measure the length and circumference of your forearm and lower leg. You will then practice using the products to decide how you best like to apply them and how much you would apply to your forearm or lower leg in order to have thorough and even coverage. The researcher will answer any questions you have about the application. Once you have a method you are satisfied with, you will wash your arms and lower legs with soap and water and dry them with a towel. The researcher will then place three small "bracelets" made of medical gauze around your arm or leg. You will then spray that area, including the bracelets, with a repellent, and a technician will remove the gauze and weigh it to determine how much spray has clung to its surface. Similarly, we will ask you to apply an amount of the lotion repellent product to your skin that you think gives complete and even coverage. We will use the

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

amounts you apply in this part of the study to determine how much repellent people normally apply.

You will also spend 15-30 minutes practicing catching mosquitoes in a laboratory cage, using an aspirator. You will be shown how to place both arms in a screen cage and turn on the aspirator using the switch on the handle. Two mosquitoes will be released in the cage. A small area (less than ½ of your forearm) will be uncovered, with no insect repellent applied. You will carefully watch the mosquitoes as they fly in the cage. Once they land on your skin, you will watch carefully to see if their needle-like mouths are placed against your skin. A researcher will be present to instruct and guide you. You may carefully move your arms to get better views and access to the mosquitoes. Once you observe a mosquito mouth touching your skin, you will immediately attempt to catch the mosquito in the plastic nozzle of the mosquito catcher. The researcher will first demonstrate the procedure to you using his or her own arms. You may practice as many times as you wish, and the researcher will be certain that your use of the mosquito catcher is correct. The mosquitoes used for this training are reared in the laboratory and free from diseases.

Visit 2

At the field site, the subjects and researchers will gather in an area without biting mosquitoes. You should not leave this area until instructed by a researcher.

You will be given an aspirator to suck any mosquitoes that land on your treated skin and attempt to bite you once the test begins. A researcher will show you again how to operate it. You will also be introduced to the technicians and other researchers who will assist you during the test. You will be instructed to call on them whenever you have questions about using the aspirator, protecting yourself from a mosquito, or reporting on a mosquito that lands on skin treated with repellent.

Before the repellent is applied, a technician will guide you in washing the lower arms and legs with mild, low fragrance soap, rinsing them with a spray of ethyl alcohol (mixed with an equal part of water), and then drying them with a clean towel. A technician will then apply insect repellents to your forearms or lower legs to give even, complete coverage of the skin. The amount of repellent applied on any one arm or leg will be no more than about ¼ teaspoon. You will also be given protective material to prevent bites on other parts of your arms and legs, plus a head net.

During the field test you and the Investigator will not know which repellent you are using. The study is done this way because knowing which repellent you are using can change the results of the study. If you start having any side effects from the repellent, the investigators can find out what you are taking in order to

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

help you. Please ask the investigator if you have any questions at all about this kind of study.

The Principal Investigator or one of his technicians will guide you into the area of the field site in which mosquitoes are active approximately 15 minutes after you have had the test repellents applied. You and a partner will watch your own exposed arms or legs and those of your partner for mosquitoes that land for one minute. A technician will let you know when the one-minute period begins and ends. If any mosquitoes land and attempt to bite the skin with repellent, you will remove them immediately with the mosquito catcher. If at any time you have difficulties using the mosquito catcher you should push the mosquito from your skin with the plastic nozzle of the catcher. You may also use your finger to brush any mosquito aside. If you brush a mosquito aside watch carefully because it may quickly return to your skin. You will report the number of mosquitoes that attempted to bite your own treated skin on a data sheet during the one-minute period when asked by a technician who will record it on a data sheet. At the end of the one-minute period you should immediately cover the skin with the protective mesh or clothing provided. Every 15 minutes a project leader will announce the beginning of the next one-minute period for testing the treated skin and watching for mosquitoes that might attempt to bite it. If more than one mosquito attempts to bite you on your treated skin in one of the one-minute periods, or if one mosquito attempts to bite in two of three consecutive exposure periods (that is, 15 or 30 minutes apart), you should cover the skin and not expose it again.

RESTRICTIONS

- You must not be a student or employee of the Principal Investigator
- You must not be hypersensitive (allergic) to mosquito bites
- You must not be sensitive to any of the test product ingredients
- You must regularly spend time in outdoor settings
- You must not have used repellents within 3 days prior to the start of the study
- You must be able to apply spray and lotion repellents to your left and right arms
- You must not use perfumed products after 9 PM the night before and throughout the tests
- You must refrain from smoking or alcoholic beverages after 9 PM the night before and throughout the tests
- You must wear specified protective clothing during mosquito testing

RISK/DISCOMFORTS

If at anytime you feel ill, inform the Principal Investigator (or anyone else who is also assisting to direct the study) immediately, and you will be taken to receive medical attention at the nearest hospital. You may also request access to standard first aid materials (such as bandages, antiseptics, and mild antihistamines) and request first aid assistance at any time. You may remove

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

yourself for any reason from the study at anytime. At least one qualified researcher will remain with the other test subjects if other researchers depart with an injured or ill subject.

The spray repellents contain alcohol and are flammable. There is a small possibility that the repellents may cause skin, lung and eye irritation. Excessive inhalation can cause lung irritation, headache and dizziness. Swallowing the products may cause temporary stomach distress. You may obtain more information about the safety of the repellents by asking the Principal Investigator, and he will provide you with the official "Material Safety Data Sheets" which give safety details similar to those found on commercial product labels.

In addition, even if you have not had a serious skin reaction to a mosquito bite previously, it is possible that such a reaction could occur if you receive any bites during this study. Swelling, redness and itching near the site of the bite are all symptoms of an allergic reaction to a mosquito bite. You should inform the Principal Investigator of one of his technicians if you are having such a reaction. There will be a first aid kit at the field site with treatments to reduce allergic symptoms from bites. Inform the Principal investigator if you are allergic to any nonprescription medicines. At least one technician with current first aid training will be present during the field test.

In addition, there is a slight possibility that you will contract a disease carried by mosquitoes if you are bitten, such as West Nile virus or equine encephalitis. This test is being conducted in an area in which such viruses have not been detected by state health or mosquito control agencies for at least a month, so the risk is probably low that any individual mosquito that might bite you carries a disease. In addition, since you are wearing repellent and other protective measures, and are carefully watching for mosquitoes that land and try to bite, you are probably at no more risk than you would experience when engaged in normal outdoor activities in a similar rural area at the same time of year.

The US Centers for Disease Control estimates that about 1-in-5 people who become infected with West Nile Virus will develop West Nile fever. For up to two weeks after the test, be alert for any flu-like symptoms (unusual tiredness or unusually severe headaches, body aches, fever, or a rash on the trunk of the body). About 1-in-150 infected people will develop more serious symptoms including neck stiffness, stupor, disorientation and possibly coma and paralysis.

Most people (about 4 out of 5) who are infected with West Nile virus will not develop any type of illness. Since you will work to quickly remove mosquitoes before they have an opportunity to bite, and few of the mosquitoes present are likely to carry the virus, your chances of getting West Nile fever or another disease from a mosquito bite are probably extremely small.

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

If you experience any of the symptoms described above in the month following the field test you should contact a medical practitioner and inform the Principal Investigator.

PREGNANCY RISKS

The risks to the unborn are unknown and if you are a woman of childbearing potential, it is important that you do not participate in this study if you are, or if you think you may be pregnant, or are lactating. Pregnancy will be self-checked by each female volunteer on the morning of the repellent test using an OTC test kit provided by the Study Director. Results of each such test will be immediately verified by direct inspection by a female technician trained to make that assessment.

UNKNOWN / UNFORESEEABLE RISKS

In addition to the risks and discomforts listed above, there may be some unknown or infrequent and unforeseeable risks associated with the use of this product, including allergic reaction or interaction with a medication. You will be informed in a timely manner both verbally and in writing of any new information, findings or changes to the way the research will be performed that might influence your willingness to continue participation in this study.

RESEARCH RELATED INJURIES

If you are injured as a result of being in this study, a consulting physician who is aware of the study will be contacted immediately by telephone. Medical treatment will be available from a health care facility. Carroll-Loye Biological Research will cover the costs of such medical treatment that are not covered by your own insurance or by a third party. If necessary, Carroll-Loye Biological Research will transport you to receive medical attention and pay costs associated with the reasonable and appropriate treatment for any injuries incurred as a result of participation in the study. For further information about this, the research test subject should call the office of Carroll-Loye Biological Research (530) 297-6080.

You DO NOT waive your legal rights by signing this form.

TREATMENT ALTERNATIVE

Since this study is not intended to provide any therapeutic or other health-related benefit, your alternative is to not participate in this study.

BENEFITS

There are no immediate benefits to you from your participation. However, by serving as a participant you may assist in making new insect repellent products available to consumers

Version : 10/24/06
Protocol: EMD-004

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

OFFER TO ANSWER ANY QUESTIONS ABOUT THIS STUDY
If you have any questions or problems during this study, or if you think that you may have experienced a research-related injury, you should contact Scott Carroll of Carroll-Loye Biological Research at (530) 297-6080 or (530) 902-8267.

If you have any questions regarding your rights as a research volunteer, please contact Kim Lerner, Chairman of the Independent Investigational Review Board, Inc. at toll free (877) 888-IIRB (4472) during regular working hours. The Independent Investigational Review Board is a committee established for the purpose of protecting the rights of volunteers in a research study.

COSTS AND REIMBURSEMENT
There will be no costs to you from participating in this study.

For participation in the study, each research study participant will receive a cash payment of $15 per hour. Payment will be made at the end of each visit or whenever you withdraw from the study. If you are designated as an 'alternate subject', you will be paid for the hours you spent being trained, plus you will receive a payment of $50 dollars to compensate for being inconvenienced by the administration of the study.

CONFIDENTIALITY
Carroll-Loye Biological Research will retain records of this study indefinitely. You may access you own records by contacting the Study Director. Representatives from the Sponsor, EMD Chemicals, Inc., the U.S. Environmental Protection Agency (EPA), the California Department of Pesticide Regulation, and the Independent Investigational Review Board, Inc. Review Board (an independent committee that reviewed the ethical aspects of this study to help protect the rights and welfare of study participants) may have access to all non-personal information collected in this study. Because of the need to release information to these parties, absolute confidentiality cannot be guaranteed. Any information or reports published as a result of this study will not identify you by name, or any other personal identification.

STATEMENTS OF UNDERSTANDING
Right to withdraw or removal from study
I understand that I am free to withdraw from this study at any time, and I agree to inform the Principal Investigator immediately if I intend to withdraw. It is understood that my decision to participate in this study or to withdraw from this study will not influence the availability of my future medical care and will involve no penalty or loss of compensation to which I am otherwise entitled. I may withdraw from this study at any time.

I agree that the Principal Investigator in charge of the study can remove me from this study without my consent for any reason, including, but not limited to:

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

a. His/her judgment that any condition or circumstance may jeopardize my welfare or the integrity of the study.
b. My failure to follow the instructions of the investigator(s).
c. If the study is stopped by the sponsor and/or Principal Investigator participating in the study prior to completion.

Consent and signatures

I have read, in a language that I understand well, and understand the information which has been stated above. I have received satisfactory answers to all of the questions, which I have asked. I hereby voluntarily consent to take part in this study and to be a research study participant in this study. I do **not** waive my legal rights by signing this Informed Consent Form. I shall receive a copy of the signed Informed Consent Authorization.

_____	_____	_____
Date/Time	**Print** Subject Name	**Sign** Subject Name
_____	Scott Carroll	_____
Date/Time	**Print** Carroll-Loye Biological Research Representative	**Sign** Carroll-Loye Biological Research Representative

Independent Investigational Review Board, Inc.
Approval: 4/18/06; Revised: 7/25/06; 9/12/06; 11/01/06

APPROVED BY
Independent IRB
Signature 11/01/06 Date

Initials: _____
Date: _____

Appendix 4. California State Department of Pesticide Regulation Experimental Subject's B
Rights.

State of California Department of Pesticide Regulation

EXPERIMENTAL SUBJECT'S BILL OF RIGHTS

The rights below are the rights of every person who is asked to be in a research study. As an experimental subject I have the following rights:

1. To be told what the study is trying to find out.

2. To be told what will happen to me and whether any of the procedures pesticides or devices is different from what would be used in standard practice.

3. To be told about the frequent and/or important risks, side effects, or discomforts of the things that will happen to me for research purposes.

4. To be told if I can expect any benefit from participating, and, if so what that benefit might be.

5. To be told the other choices I have and how they may be better or worse than being in the study.

6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study.

7. To be told what sort of medical treatment is available if any complications arise.

8. To refuse to participate at all or to change my mind about participation after the study is started. This decision will not affect my right to receive the care I would receive if I were not in the study.

9. To receive a copy of the signed and dated consent form.

10. To be free of pressure when considering whether I wish to agree to be in the study.

If I have other questions I should ask the researcher. In addition, I may contact the Worker Health and Safety Branch, Department of Pesticide Regulation, which is concerned with protection of volunteers in research projects. I may reach them by calling (916) 445-4222 collect from 8:00 AM-5:00 PM., Monday to Friday or by writing to the Department of Pesticide Regulation, Worker Health and Safety Branch, 830 K. St., Sacramento, CA 95814-4268.

Appendix 8. Completed Dosimetry Data Capture Forms

Limb Measurement Form
Study EMD-003/004
Date: 24 Oct. 2006

Subject name:
Subject number: 13

Data recorder name: Scott Carroll
Data recorder signature:

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25	25	36	36
Lower (A)	16.5	16.5	24.5	24.5
Lower-mid (B)	20.5	20.5	30	30.5
Upper-mid (C)	26	26	37.5	37
Upper (D)	27	27	34	34

Limb Measurement Form
Study EMD-003/004

Date: 25 Oct. 2006

Subject name:

Subject number: 14

Data recorder name: Bill Johnson

Data recorder signature: WKJ

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26.0	26.5	36.5	36.5
Lower (A)	17.0	17.0	23.0	23.0
Lower-mid (B)	18.5	18.5	24.0	24.5
Upper-mid (C)	23.0	24.0	36.5	35.5
Upper (D)	27.5	28.0	34.5	35.0

Limb Measurement Form
Study EMD-003/004
Date: 1 Nov. 2006

Subject name:
Subject number: 15

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25.5	25.5	33	33
Lower (A)	15.5	15.7	19.5	19.5
Lower-mid (B)	18	18	23	23.5
Upper-mid (C)	26	26	33	~~34.5~~ 34.0 EE SBK
Upper (D)	27.5	27	31	32

Limb Measurement Form
Study EMD-003/004

Date: 23 Oct. 2006

Subject name:
Subject number: 19

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	20.5	21.0	35.5	35.5
Lower (A)	15.5	16.0	22.0	22.0
Lower-mid (B)	17.5	17.0	26.5	28.5
Upper-mid (C)	21.5	22.0	35.0	35.0
Upper (D)	24.0	24.0	31.5	31.5

Limb Measurement Form
Study EMD-003/004
Date: Oct. 23, 2006

Subject name: _____
Subject number: 23

Data recorder name: Bill Johnson
Data recorder signature: W.K. J

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26.5	26.2	31	31.5
Lower (A)	14.9	15.1	20.2	20.4
Lower-mid (B)	17.3	18	27.5	27.4
Upper-mid (C)	22.6	22.2	34	34.6
Upper (D)	23.5	23.8	32	32.4

Limb Measurement Form
Study EMD-003/004

Date: 30 OCT 06

Subject name:
Subject number: 24

Data recorder name: Scott Carroll
Data recorder signature: [signature]

Limb Measurements (cm)	Left arm	Right arm	Left leg	Right leg
Length	25.5	25	36	36.8
Lower (A)	16.6	16.5	23.4	23.5
Lower-mid (B)	22.2	21.5 (EE) ~~29~~ SC	29.4	31.5
Upper-mid (C)	27	27.5 SC ~~26.5~~ (EE)	38.1	38
Upper (D)	27.5	(EE) SC ~~25.4~~ 28.5	34.6	34

Limb Measurement Form
Study EMD-003/004

Date: 24 oct 2006

Subject name: _____ **Data recorder name:** Bill Johnson

Subject number: 26 **Data recorder signature:** WK Jl

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	28.3	28.4	38.0	38.5
Lower (A)	15.7	15.6	21.5	21.0
Lower-mid (B)	16.9	17.3	28.7	28.4
Upper-mid (C)	21.0	21.6	35.0	34.6
Upper (D)	22.7	24.0	31.6	32.4

Limb Measurement Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: 2

Data recorder name: Scott Garrett
Data recorder signature: Scott Garrett

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26.5	27.0	33.0	33
Lower (A)	19	19.5	25.5	25.6
Lower-mid (B)	25.6	25.5	33.7	30.7
Upper-mid (C)	32	32.0	41.5	41.0
Upper (D)	32.5	31.6	38.4	39.0

Limb Measurement Form
Study EMD-003/004

Date: 25 Oct. 2006

Subject name:
Subject number: 30

Data recorder name: Bill Johnson
Data recorder signature: W.K. John

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	24.0	23.5	35.5	34.5
Lower (A)	14.5	14.5	19.5	20.0
Lower-mid (B)	15.0	15.5	25.0	24.5
Upper-mid (C)	21.5	21.5	34.5	35.0
Upper (D)	22.5	22.5	31.0	32.0

Limb Measurement Form
Study EMD-003/004

Date: 27 October 2006

Subject name: _____

Data recorder name: Bill Johnson

Subject number: 31

Data recorder signature:

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25.5	25.5		
Lower (A)	16.5	17.0		
Lower-mid (B)	19	19.3		
Upper-mid (C)	25.5	25.5		
Upper (D)	25.5	25.5		

Limb Measurement Form
Study EMD-003/004

Date: 28 October 2006

Subject name:
Subject number: 32

Data recorder name: Bill Johnson
Data recorder signature: W K Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	30.0	29.0		
Lower (A)	17.0	17.5		
Lower-mid (B)	19.0	19.0		
Upper-mid (C)	24.0	23.5		
Upper (D)	25.0	25.0		

Limb Measurement Form
Study EMD-003/004
Date: 26 Oct. 2006

Subject name:
Subject number: 33

Data recorder name: Scott Carroll
Data recorder signature: Scott Carroll

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	24.5	24		
Lower (A)	15.0	15.5		
Lower-mid (B)	20.3	20.6		
Upper-mid (C)	20.9	21.2		
Upper (D)	22.0	22.0		

Limb Measurement Form
Study EMD-003/004

Date: 28 October 2006

Subject name: _____

Subject number: 34

Data recorder name: Bill Johnson

Data recorder signature: W. K. John

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26.0	26.0		
Lower (A)	14.5	15.0		
Lower-mid (B)	15.5	16.0		
Upper-mid (C)	20.5	21.0		
Upper (D)	22.0	22.5		

Limb Measurement Form
Study EMD-003/004
Date: 28 Oct 2006

Subject name:
Subject number: 35

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	23.0	22.0		
Lower (A)	15.0	15.0		
Lower-mid (B)	17.5	17.4		
Upper-mid (C)	22.2	22.0		
Upper (D)	23.7	24.0		

Limb Measurement Form
Study EMD-003/004

Date: 28 oct. 2006

Subject name: _____ **Data recorder name:** Bill Johnson

Subject number: 36 **Data recorder signature:** WK Joh

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	22.0	22.0		
Lower (A)	14.7	15.0		
Lower-mid (B)	17.0	16.5		
Upper-mid (C)	21.4	21.5		
Upper (D)	22.6	23.0		

Limb Measurement Form
Study EMD-003/004
Date: 18 oct 2006

Subject name: _____
Subject number: 37

Data recorder name: Bill Johnson
Data recorder signature: W K Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25	25.5		
Lower (A)	15	15		
Lower-mid (B)	17.5	17.5		
Upper-mid (C)	22	22.5		
Upper (D)	23	23.5		

Limb Measurement Form
Study EMD-003/004
Date: 28 Oct. 2006

Subject name:
Subject number: 38

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	28.0	28.0		
Lower (A)	16.4	16.5		
Lower-mid (B)	17.5	18.0		
Upper-mid (C)	23.3	23.5		
Upper (D)	25.7	26.0		

EF WKJ

Limb Measurement Form
Study EMD-003/004

Date: 28 Oct. 2006

Subject name: _____

Subject number: 39

Data recorder name: Bill Johnson

Data recorder signature: Wik. [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25.5	25.0		
Lower (A)	14.5	15.0		
Lower-mid (B)	17.0	17.0		
Upper-mid (C)	20.5	21.0		
Upper (D)	21.5	22.0		

Limb Measurement Form
Study EMD-003/004

Date: 28 October 2006

Subject name: _____ **Data recorder name:** Shawn B. King

Subject number: 40 **Data recorder signature:** S. B. K

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25	24		
Lower (A)	14.6	14.7		
Lower-mid (B)	15.4	15.6		
Upper-mid (C)	18.8	21.2		
Upper (D)	22.2	22.5		

Limb Measurement Form
Study EMD-003/004

Date: 28 Oct. 2006

Subject name: _____

Subject number: 41

Data recorder name: Bill Johnson

Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	22.5	23.0		
Lower (A)	15.7	16.0		
Lower-mid (B)	18.5	18.5		
Upper-mid (C)	23.2	23.5		
Upper (D)	24.0	24.0		

Limb Measurement Form
Study EMD-003/004

Date: 26 OCT 2006

Subject name:
Subject number: 42

Data recorder name: Scott Carroll
Data recorder signature: Scott Carroll

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	28	28	~~27~~ 35	35
Lower (A)	17.5 ~~21~~	18.5	24.5	24.8
Lower-mid (B)	21.8	23.6	32.3	31.8
Upper-mid (C)	25.7	25.2	37.6	38
Upper (D)	28	28.4	35.8	35.3

Limb Measurement Form
Study EMD-003/004

Date: 29 october, 2006

Subject name: _____

Subject number: 43

Data recorder name: Bill Johnson

Data recorder signature: WKJ

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25.5	24.5		
Lower (A)	17.5	17.0		
Lower-mid (B)	21.5	21.0		
Upper-mid (C)	26.5	29.0		
Upper (D)	29.0	29.0		

Limb Measurement Form
EMD-003/004

Date: 29 October 2006

Subject name: _____ **Data recorder name:** Bill Johnson

Subject number: 44 **Data recorder signature:** W.K. [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	22.0	22.5		
Lower (A)	13.5	13.5		
Lower-mid (B)	16.4	15.5		
Upper-mid (C)	20.0	20.0		
Upper (D)	20.6	21.0		

Limb Measurement Form
Study EMD-003/004

Date: 29 October 2006

Subject name: _____ **Data recorder name:** Bill Johnson

Subject number: 45 **Data recorder signature:** W.K. Joh

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	21.5	21.5		
Lower (A)	14.0	13.8		
Lower-mid (B)	16.0	EE WKJ ~~18~~ 16.7		
Upper-mid (C)	20.5	21.5		
Upper (D)	21.5	21.5		

Limb Measurement Form
Study EMD-003/004

Date: 29 October, 2006

Subject name:
Subject number: 46

Data recorder name: Bill Johnson
Data recorder signature: W K Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	24.0	24.8		
Lower (A)	18.0	17.7		
Lower-mid (B)	23.7	23.7		
Upper-mid (C)	31.0	38.5		
Upper (D)	30.2	31.0		

Limb Measurement Form
Study EMD-003/004
Date: 29 October, 2006

Subject name:
Subject number: 47

Data recorder name: Bill Johnson
Data recorder signature: W.K. Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	21.5	21.5		
Lower (A)	14.6	15		
Lower-mid (B)	18	17.5		
Upper-mid (C)	22.7	23		
Upper (D)	23.5	23.5		

Limb Measurement Form
Study EMD-003/004

Date: 29 October 2006

Subject name: _____

Data recorder name: Bill Johnson

Subject number: 48

Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	21.5	21.5		
Lower (A)	16	15.5		
Lower-mid (B)	20	21.5		
Upper-mid (C)	24	25.5		
Upper (D)	25.5	25.5		

E1

Limb Measurement Form
Study EMD-003/004
Date: 29 October, 2006

Subject name:
Subject number: 49

Data recorder name: Bill Johnson
Data recorder signature: W K Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	25.5	25.5		
Lower (A)	16.7	17.0		
Lower-mid (B)	21.0	20.5		
Upper-mid (C)	26.0	26.7		
Upper (D)	25.5	27.0		

Limb Measurement Form
Study EMD-003/004
Date: 24 Oct. 2006

Subject name:
Subject number: 4

Data recorder name: Bill Johnson
Data recorder signature: W. K. Jo

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	24.5	25.0	33.0	34.0
Lower (A)	15.4	14.9	18.4	18.3
Lower-mid (B)	16.0	16.0	20.2	21.6
Upper-mid (C)	20.1	19.7	29.5	29.4
Upper (D)	21.9	21.5	27.7	27.9

Limb Measurement Form
Study EMD-003/004

Date: 30 Oct. 2006

Subject name:
Subject number: 50

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	22.0	21.5		
Lower (A)	15.0	14.5		
Lower-mid (B)	16.0	16.0		
Upper-mid (C)	(EE) WKJ 30/10/06 ~~19.0~~ 21.5	22.5		
Upper (D)	23.0	23.5		

Limb Measurement Form
Study EMD-003/004
Date: 30 Oct 2006

Subject name:
Subject number: 51

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	24	24		
Lower (A)	16	16		
Lower-mid (B)	21 (EE) WKS ~~20.5~~ 30/10/06	20.5		
Upper-mid (C)	27	27.5		
Upper (D)	27.5	27.5		

Limb Measurement Form
Study EMD-003/004

Date: 31 OCT 2006

Subject name:
Subject number: 52

Data recorder name: Scott Carroll
Data recorder signature:

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length		25.5		32
Lower (A)		18.4		23.5
Lower-mid (B)		24.2		32
Upper-mid (C)		29.5		40.4
Upper (D)		30.4		40.4

Limb Measurement Form
Study EMD-003/004

Date: 31 OCT 2006

Subject name:
Subject number: 53

Data recorder name: Scott Carroll
Data recorder signature: S.R. Call

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	22		30.5	
Lower (A)	15		23.5	
Lower-mid (B)	19.5		31	
Upper-mid (C)	24		38	
Upper (D)	25.5		35	

Limb Measurement Form
Study EMD-003/004
Date: 31 oct. 2006

Subject name:
Subject number: 54

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26		33	
Lower (A)	18		23	
Lower-mid (B)	21.5		26	
Upper-mid (C)	25.5		37	
Upper (D)	28		34.5	

Limb Measurement Form
Study EMD-003/004
Date: 1 Nov. 2006

Subject name:
Subject number: 55

Data recorder name: Jeremy Brooks
Data recorder signature: Jeremy Brooks

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	26.5	26.5	32.0	
Lower (A)	16.5	16.5	21.5	
Lower-mid (B)	19.5	19.5	24.5	
Upper-mid (C)	~~26.0~~ 26.0 EBWKS	26.0	33.0	
Upper (D)	26.6	26.5	31.0	

Limb Measurement Form
Study EMD-003/004
Date:

Subject name: _____ **Data recorder name:**
Subject number: 56 **Data recorder signature:**

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	23.5	23.5	33.0	32.5
Lower (A)	15.5	15.5	22.5	22.0
Lower-mid (B)	20.5	19.5	31.0	32.0
Upper-mid (C)	23.0	23.5	37.5	37.5
Upper (D)	25.0	25.0	35.5	35.5

Limb Measurement Form
Study EMD-003/004
Date: 24 oct. 2006

Subject name: _____ **Data recorder name:** Bill Johnson
Subject number: 6 **Data recorder signature:** [illegible]

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	28.0	27.0	34.0	34.5
Lower (A)	18.5	18.5	23.0	22.5
Lower-mid (B)	21.0	22.0	27.0	28.5
Upper-mid (C)	29.5	30.0	37.5	38.5
Upper (D)	29.0	29.0	36.0	35.5

Limb Measurement Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: 9

Data recorder name: Bill Johnson
Data recorder signature: W. E. Johnson

Limb Measurements	Left arm	Right arm	Left leg	Right leg
Length	23.0	23.5	38.0	36.5
Lower (A)	15.5	15.5	22.5	23.0
Lower-mid (B)	17.0	17.5	30.5	28.5
Upper-mid (C)	21.5	22.0	35.5	35.5
Upper (D)	23.5	23.5	32.5	33.0

Lotion Data Form
Study EMD-003/004
Date: 28 Oct. 2006

Subject name:
Subject number: 2

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

I. Controls

A. Left arm

Dosimeter before (g)	Dosimeter after (g)
4.1398	4.1408

B. Right arm

Dosimeter before (g)	Dosimeter after (g)
4.4299	4.4306

C. Left leg

Dosimeter before (g)	Dosimeter after (g)
6.0888	6.0899

D. Right leg

Dosimeter before (g)	Dosimeter after (g)
5.8880	5.8896

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	106.500	105.078
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	105.078	104.742
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	104.742	103.779
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	103.779	102.734
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	102.734	102.309
2	102.309	101.680
3	101.680	101.036

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	101.036	100.217
2	100.217	99.603
3	99.603	99.060

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	99.060	97.620
2	97.620	96.528
3	96.528	96.403

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	96.403	94.080
2	94.080	92.649
3	92.649	90.565

Lotion Data Form
Study EMD-003/004
Date: 24 Oct 20 06

Subject name:
Subject number: 4

Data recorder name: Bill Johnson
Data recorder signature: W K Johnson

I. Controls

WKJ 24/10/06
A. ~~Lotion~~, left arm

Dosimeter before (g)	Dosimeter after (g)
5.4055	5.4060

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

WKJ 24/10/06
C. ~~Lotion~~, left leg

Dosimeter before (g)	Dosimeter after (g)
5.4060	5.4073

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	116.725	116.417
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	116.417	116.169
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	116.169	115.508
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	115.508	114.534
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	114.534	114.265
2	113.372	112.790
3	110.418	109.625

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	114.265	114.023
2	112.790	112.339
3	109.625	109.085

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	114.023	113.658
2	112.339	111.663
3	109.085	108.302

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	113.658	113.372
2	111.663	110.418
3	108.302	107.260

Lotion Data Form
Study EMD-003/004
Date: 24 October, 2006

Subject name:
Subject number: 6

Data recorder name: Bill Johnson
Data recorder signature: W.K. [illegible]

I. Controls

A. Lotion, left arm

Dosimeter before (g)	Dosimeter after (g)
2.4821	2.4827
3.9293	3.9313

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

C. Lotion, left leg

Dosimeter before (g)	Dosimeter after (g)
2.5999	2.6022
5.9939	5.9970

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	107.107	105.775
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	105.775	104.676
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	104.676	103.148
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	103.148	101.237
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	101.237	100.274
2	97.328	95.940
3	91.917	90.813

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	100.274	99.424
2	95.940	95.185
3	90.813	89.691

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	99.424	98.342
2	95.185	93.676
3	89.691	88.031

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	98.342	97.328
2	93.676	91.917
3	88.031	86.811

Lotion Data Form
Study EMD-003/004
Date: 24 october 2006

Subject name:
Subject number: 13

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

I. Controls

WKJ 27/10/06

A. ~~Lotion~~, left arm

Dosimeter before (g)	Dosimeter after (g)
3.8352	3.8359

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

WKJ 27/10/06

C. ~~Lotion~~, left leg

Dosimeter before (g)	Dosimeter after (g)
5.4095	5.4115

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	61.460	60.662
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	60.662	59.796
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	59.796	57.450
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	57.450	54.084
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	54.084	53.123
2	53.123	52.235
3	52.235	51.341

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	51.341	50.622
2	50.622	49.672
3	49.672	49.053

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	49.053	46.073
2	46.073	43.770
3	43.770	~~43.735~~ 41.735

WKJ EE

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	41.735	39.955
2	39.955	37.977
3	37.977	35.600

Lotion Data Form
Study EMD-003/004
Date: 25 oct. 2006

Subject name:
Subject number: 14

Data recorder name: Bill Johnson
Data recorder signature: wk

I. Controls	
A. Left arm	
Dosimeter before (g)	Dosimeter after (g)
2.2188	2.2202
B. Right arm	
Dosimeter before (g)	Dosimeter after (g)
C. Left leg	
Dosimeter before (g)	Dosimeter after (g)
2.5510	2.5527
D. Right leg	
Dosimeter before (g)	Dosimeter after (g)

II. Practice Application		
A. Lotion, left arm		
Trial number	Mass before (g)	Mass after (g)
1	121.883	121.160
2		
3		
B. Lotion, right arm		
Trial number	Mass before (g)	Mass after (g)
1	121.160	120.374
2		
3		
C. Lotion, left leg		
Trial number	Mass before (g)	Mass after (g)
1	120.374	119.137
2		
3		
D. Lotion, right leg		
Trial number	Mass before (g)	Mass after (g)
1	119.137	118.154
2		
3		

III. Lotion Sampling		
A. Lotion, left arm		
Trial number	Mass before (g)	Mass after (g)
1	117.948	116.935
2	114.376	113.779
3	110.631	109.981
B. Lotion, right arm		
Trial number	Mass before (g)	Mass after (g)
1	116.935	116.308
2	113.779	113.091
3	109.981	109.068
C. Lotion, left leg		
Trial number	Mass before (g)	Mass after (g)
1	116.308	115.074
2	113.091	111.840
3	109.068	108.044
D. Lotion, right leg		
Trial number	Mass before (g)	Mass after (g)
1	115.074	114.376
2	111.840	110.631
3	108.044	106.687

Lotion Data Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: 19

Data recorder name: Jennifer Kuhn
Data recorder signature: Jen Kuhn

I. Controls

WKT 23/10/06
A. Lotion, left arm

Dosimeter before (g)	Dosimeter after (g)
4.2257 JK	4.2282

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

WKT 23/10/06
C. Lotion, left leg

Dosimeter before (g)	Dosimeter after (g)
5.2828	5.2838

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	127.085	126.425
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	126.425	125.886
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	125.886	124.721
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	124.722	123.907
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	123.907	123.369
2	121.348	120.953
3	119.152	118.408

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	123.369	122.509
2	120.953	120.506
3	118.408	118.069

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	122.510	121.904
2	120.506	119.775
3	118.069	117.421

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	121.904	121.357
2	119.775	119.152
3	117.421	116.839

Lotion Data Form
Study EMD-003/004
Date: 24 Oct. 2006

Subject name:
Subject number: 23

Data recorder name: Jennifer Kuhn
Data recorder signature:

I. Controls

A. Left arm

Dosimeter before (g)	Dosimeter after (g)
4.9657	4.9659

B. Right arm

Dosimeter before (g)	Dosimeter after (g)
4.9780	4.9786

C. Left leg

Dosimeter before (g)	Dosimeter after (g)
6.0332	6.0338

D. Right leg

Dosimeter before (g)	Dosimeter after (g)
6.6212	6.6218

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	110.131	109.362
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	109.363	108.514
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	108.514	107.410
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	107.410	106.738
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	97.986	97.331
2	97.330	96.729
3	93.979	92.719

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	101.908	100.993
2	96.729	96.188
3	92.719	91.730

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	100.993	99.492
2	96.188	~~99.492~~ 95.101
3	91.730	90.303

JK

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	99.492	97.995
2	95.101	93.978
3	90.303	89.147

Lotion Data Form
Study EMD-003/004
Date: 24 Oct 06

Subject name:
Subject number: 26

Data recorder name: Scott Carroll
Data recorder signature: [signature]

I. Controls

WKS 24/10/06

A. Lotion, left arm

Dosimeter before (g)	Dosimeter after (g)
4.4841	4.4850
~~4.4850~~	~~4.4900~~

EE

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

WKS 24/10/06

C. Lotion, left leg

Dosimeter before (g)	Dosimeter after (g)
4.4880	4.4900

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	134.656	134.310
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	~~132.8~~	
2	133.215	132.842
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	134.310	133.215
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	132.842	131.976
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	131.974	131.519
2	129.220	128.718
3	126.933	126.432

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	131.519	131.135
2	128.718	128.250
3	126.432	126.055

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	131.135	~~131.155~~ 130.180
2	128.250	127.851
3	126.055	125.515

EE

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	~~127.735~~ 130.180	129.220
2	~~128.851~~ 127.851	126.934
3	125.515	124.972

Lotion Data Form
Study EMD-003/004
Date: 25 Oct. 2006

Subject name:
Subject number: 30

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

I. Controls

A. Lotion, left arm

Dosimeter before (g)	Dosimeter after (g)
2.2388	2.2399

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

C. Lotion, left leg

Dosimeter before (g)	Dosimeter after (g)
2.4420	2.4438

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	117.115	116.782
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	116.782	116.542
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	116.542	116.108
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	116.108	
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	115.911	115.715
2	114.190	113.856
3	112.411	112.008

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	115.715	115.427
2	113.856	113.441
3	112.008	111.531

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	115.427	114.714
2	113.441	112.868
3	111.531	110.863

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	114.714	114.190
2	112.868	112.411
3	110.863	110.141

Lotion Data Form
Study EMD-003/004
Date: 24 Oct. 2006

Subject name:
Subject number: 42

Data recorder name: Bill Johnson
Data recorder signature: W. K. Johnson

I. Controls

A. Left arm

Dosimeter before (g)	Dosimeter after (g)
4.4162	4.4176

B. Right arm

Dosimeter before (g)	Dosimeter after (g)
5.WKS	

C. Left leg

Dosimeter before (g)	Dosimeter after (g)
5.3112	5.3131

D. Right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	86.782	85.674
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	85.674	84.340
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	84.340	82.706
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	82.706	80.835
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	80.835	79.816
2	75.128	74.059
3	69.050	67.567

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	79.816	78.799
2	74.059	73.071
3	67.567	66.655

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	78.799	77.240
2	73.071	71.223
3	66.655	64.003

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	77.240	75.128
2	71.223	69.050
3	64.003	61.531

Lotion Data Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: 56

Data recorder name: Bill Johnson
Data recorder signature: W.K. J

I. Controls

A. Left arm

Dosimeter before (g)	Dosimeter after (g)
2.2727	2.2732

B. Right arm

Dosimeter before (g)	Dosimeter after (g)

C. Left leg

Dosimeter before (g)	Dosimeter after (g)
2.5902	2.5911

D. Right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	90.564	89.400
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	89.400	88.805
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	88.805	87.322
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	87.322	85.665
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	85.664	85.230
2	85.230	84.895
3	84.895	84.420

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	84.420	83.969
2	83.969	83.771
3	83.771	83.526

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	83.526	82.082
2	82.082	81.006
3	81.006	79.949

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	79.949	78.633
2	78.633	77.501
3	77.501	76.519

Lotion Data Form
Study EMD-003/004
Date: 23 Oct., 2006

Subject name:
Subject number: 9

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

I. Controls

A. Lotion, left arm

Dosimeter before (g)	Dosimeter after (g)
4.2638	4.2657

B. Lotion, right arm

Dosimeter before (g)	Dosimeter after (g)

C. Lotion, left leg

Dosimeter before (g)	Dosimeter after (g)
4.4392	4.4409

D. Lotion, right leg

Dosimeter before (g)	Dosimeter after (g)

II. Practice Application

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	135.792	135.290
2		
3		

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	135.290	134.945
2		
3		

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	134.945	134.062
2		
3		

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	134.062	133.153
2		
3		

III. Lotion Sampling

A. Lotion, left arm

Trial number	Mass before (g)	Mass after (g)
1	133.153	132.813
2	131.329	130.973
3	129.227	128.938

B. Lotion, right arm

Trial number	Mass before (g)	Mass after (g)
1	132.813	132.552
2	130.973	130.718
3	128.938	128.672

C. Lotion, left leg

Trial number	Mass before (g)	Mass after (g)
1	132.552	132.087
2	130.718	129.894
3	128.672	127.955

D. Lotion, right leg

Trial number	Mass before (g)	Mass after (g)
1	132.087	131.329
2	129.894	129.227
3	127.955	127.088

Pump Data Form
Study EMD-003/004
Date: ~~10/28~~ EE KJ 28 Oct. 2006

Subject name:
Subject number: 2

Data recorder name: Scott Carroll
Data recorder signature: [signature]

I. Practice Application				
A. Pump spray, left arm				
Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
1	6	9	133.719	131.540
2				
3				
B. Pump spray, right arm				
1	9	9	133.296	132.122
2				
3				
C. Pump spray, left leg				
1	8	10	132.122	130.853
2				
3				
D. Pump spray, right leg				
1	8	10	130.852	129.568
2				
3				

II. Pump Sampling						
A. Pump spray, left arm						
Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
1	8	9	131.540 ~~5.8942~~	129.835	5.8942	5.9868
2	8	9	125.416	124.362	4.5439	4.6082
3	8	9	119.852	118.466	4.5921	4.7185
B. Pump spray, right arm						
1	8	9	129.835	128.222	5.3187	5.3792
2	9	10	124.362	122.968	4.5938	4.7090
3	9	10	118.464	116.994	4.1372	4.2207
C. Pump spray, left leg						
1	11	10	128.221	126.938	4.3183	4.3600
2	10	11	122.967	121.752	4.9980	5.0751
3	9	11	116.994	115.450	5.0340	5.1065
D. Pump spray, right leg						
1	10	11	126.937	125.416	5.1674	5.2312
2	10	11	121.751	119.860	6.0661	6.1304
3	10	12	115.450	113.990	6.6868	6.7644

Pump Data Form
Study EMD-003/004
Date: 24 oct. 2006

Subject name:
Subject number: 4

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	15	7	112.968	111.917
2				
3				
B. Pump spray, right arm				
1	16	7	111.917	110.866
2				
3				
C. Pump spray, left leg				
1	11	10	132.863	131.570
2				
3				
D. Pump spray, right leg				
1	13	9	131.570	130.302
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	15	8	110.866	109.681	4.7723	4.8717
2	13	8	109.681	108.513	4.8894	4.9857
3	12	7	108.513	107.470	4.8684	4.9537
B. Pump spray, right arm						
1	13	8	107.740	106.282	4.8999	5.0224
2	11	7	106.282	105.233	4.9690	5.0777
3	12	8	105.233	104.071	5.0020	5.1557
C. Pump spray, left leg						
1	9	10	130.301	128.884	4.9685	5.0795
2	15	9	128.884	127.603	4.9776	5.0406
3	9	10	127.603	126.256	5.1050	5.2115
D. Pump spray, right leg						
1	8	11	126.256	124.760	5.0150	5.1418
2	9	10.5	124.760	123.371	5.0902	5.2172
3	9	9.5	123.371	122.040	4.9106	5.0236

Pump Data Form
Study EMD-003/004
Date: 24 oct. 2006

Subject name:
Subject number: 6

Data recorder name: Bill Johnson
Data recorder signature: W.K. [illegible]

I. Practice Application

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
1	10	9.5	88.223	86.977
2	~~11~~ EE WKJ			
3				

B. Pump spray, right arm

1	11	9	86.977	85.476
2				
3				

C. Pump spray, left leg

1	12	10.5	85.476	84.050
2				
3				

D. Pump spray, right leg

1	12	10	84.050	82.541
2				
3				

II. Pump Sampling

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
1	12	9	82.533	81.013	4.1917	4.3212
2	10	9	81.013	79.501	4.4084	4.5766
3	11	9	79.501	78.139	4.5640	4.6770

B. Pump spray, right arm

1	10	9.5	78.139	76.622	4.5430	4.6317
2	12	10	76.622	75.108	4.6769	4.8541
3	11	9	75.108	73.755	4.4671	4.6111

C. Pump spray, left leg

1	13	13	73.755	71.804	5.8588	6.0196
2	13	13	71.804	69.925	6.1188	6.3215
EE WKJ ~~3~~	~~11~~ EE	WKJ	~~69.925~~	EE WKJ	~~6.0791~~	EE WKJ
3	11	13.5	69.208	67.194	5.9480	6.0012

D. Pump spray, right leg

1	10	13.5	67.194	64.941	5.7055	5.9279
2	9	14	64.941	62.707	5.9976	6.2245
3	11	14.5	62.707	60.549	4.7008	4.9222

Pump Data Form
Study EMD-003/004
Date: 24 Oct. 2006

Subject name:
Subject number: 13

Data recorder name: Bill Johnson
Data recorder signature: W. K. Johnson

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	10	11	90.790	89.419
2				
3				
B. Pump spray, right arm				
1	10	10	89.419	88.137
2				
3				
C. Pump spray, left leg				
1	12	15	88.137	86.217
2				
3				
D. Pump spray, right leg				
1	12	12	86.217	84.424
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	9	10	84.408	83.025	4.8168	4.9204
2	9	9	83.025	81.736	5.2094	5.2890
3	10	10	81.736	80.365	5.2997	5.4077
B. Pump spray, right arm						
1	10	11	80.365	78.879	5.2857	5.4542
2	9	10	78.879	77.540	5.3022	5.4711
3	10	10	77.540	76.104	4.8687	5.0119
C. Pump spray, left leg						
1	12	14	76.104	73.970	5.4475	5.5826
2	11	12	73.970	72.314	5.7076	5.9039
3	11	11	72.314	70.860	5.5948	5.7101
D. Pump spray, right leg						
1	11	11	70.860	69.289	5.7711	5.8590
2	11	11	69.289	67.853	5.2853	5.4362
3	10	12	67.853	66.142	5.7130	5.9177

Pump Data Form
Study EMD-003/004
Date: 25 oct. 2006

Subject name:
Subject number: 14

Data recorder name: Bill Johnson
Data recorder signature: W.K. John

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	9	8	129.266	128.075
2				
3				
B. Pump spray, right arm				
1	10	10	128.075	126.620
2				
3				
C. Pump spray, left leg				
1	9	15	126.620	124.411
2				
3				
D. Pump spray, right leg				
1	15	16	124.411	122.061
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	11	13	122.051	120.233	4.4244	4.5471
2	10	14	120.233	118.169	4.3941	4.5576
3	10	14	118.169	116.094	4.3427	4.4762
B. Pump spray, right arm						
1	12	16	116.094	113.754	4.2564	4.4280
2	15	15	113.754	111.530	4.3036	4.4825
3	16	16	111.530	109.175	4.2725	4.4572
C. Pump spray, left leg						
1	13	20	109.175	106.237	5.4058	5.5218
2	17	24	106.237	102.707	4.7749	4.9360
3	17	21	102.707	99.615	5.0979	5.2275
D. Pump spray, right leg						
1	18	20	99.615	96.671	4.9237	5.0311
2	17	20	96.671	93.736	5.1000	5.2359
3	15	20	93.736	90.796	5.0355	5.1734

Pump Data Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: 19

Data recorder name: Bill Johnson
Data recorder signature: W.K. Johnson

I. Practice Application

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
1	13	3	115.241	114.788
2				
3				

B. Pump spray, right arm

1	12	3	114.788	114.335
2				
3				

C. Pump spray, left leg

1	12	4	114.335	113.728
2				
3				

D. Pump spray, right leg

1	14	4	113.728	113.125
2				
3				

II. Pump Sampling

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
1	15	3	113.125	112.650	4.5355	4.5569
2	15	4	111.228	110.398	4.2230	4.2597
3	15	4	110.395	109.168	4.1973	4.2396

B. Pump spray, right arm

1	13	3	112.650	112.202	4.2280	4.2591
2	14	4	109.168	108.566	4.6141	4.6455
3	14	4	108.566	107.966	4.8395	4.8852

C. Pump spray, left leg

1	16	4	112.202	111.599	5.2826	5.2917
2	13	5	107.966	107.218	5.5322	5.6400
3	11	7	65.125	64.087	4.9561	5.0351

D. Pump spray, right leg

1	14	4	111.598	110.992	5.3465	5.3743
2	14	5	107.217	106.471	5.5635	5.5862
3	12	7	66.164	65.125	4.9682	5.0410

Pump Data Form
Study EMD-003/004
Date: 24 Oct. 2006 JR

Subject name:
Subject number: 23

Data recorder name: Jennifer Kahn
Data recorder signature:

I. Practice Application

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
1	16	7	127.736	126.289
2				
3				

B. Pump spray, right arm

1	16.5	8	126.289	125.122
2				
3				

C. Pump spray, left leg

1	23	13	125.120	123.171
2				
3				

D. Pump spray, right leg

1	22	12	123.171	121.690
2				
3				

II. Pump Sampling

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
1	16	9	121.685	120.486	5.5453	5.6258
2	16	9	116.154 ~~120.486~~	115.027 ~~119.460~~	5.7084 ~~5.7147~~	5.8326 ~~5.7762~~ JR
3	16	8	110.528	109.672	5.5182	5.5842

B. Pump spray, right arm

1	16	9	120.486	119.460	5.7084	5.7762
2	16	8	115.027	113.858	5.7705	5.8486
3	16	9	109.672	108.536	5.7605	5.8448

C. Pump spray, left leg

1	22	11	119.460	117.792	6.4814	6.5783
2	22	11	113.858	112.243	6.5895	6.6891
3	21.5	12	108.536	107.144	6.4445	6.5313

D. Pump spray, right leg

1	22	11	117.787	116.154	6.3456	6.4266
2	22	12	112.243	110.528	6.5745	6.6667
3	22	11	107.144	105.550	6.8421	7.0003

JR

Pump Data Form
Study EMD-003/004
Date: 25 Oct. 2006

Subject name:
Subject number: 30

Data recorder name: Bill Johnson
Data recorder signature: W.K. Johnson

I. Practice Application

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
1	12	8	95.268	94.250
2				
3				

B. Pump spray, right arm

1	8	8	94.250	93.299
2				
3				

C. Pump spray, left leg

1	11	11	93.299	91.744
2				
3				

D. Pump spray, right leg

1	7	11	91.744	90.436
2				
3				

II. Pump Sampling

A. Pump spray, left arm

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
1	10	~~8~~ 10 EB 30/10/06	90.430	88.882	3.9313	4.0473
2	8	12	88.882	87.205	4.1478	4.3333
3	10	11	87.205	85.569	3.9401	4.2333

B. Pump spray, right arm

1	6.5	12	85.569	83.960	4.2508 EB WKS ~~4.2508~~	4.5238
2	9	14	83.960	81.983	3.7698	4.1323
3	5.5	14	81.983	79.886	3.7935	4.1133

C. Pump spray, left leg

1	3	22	79.886	76.974	4.5766	4.9564
2	4	22	76.974	74.090	5.1533	5.5479
3	5	18	74.090	71.877 ~~78.877~~ EB WKS 30/10/06	4.7116	5.0114

D. Pump spray, right leg

1	3.5	24	71.877	69.031	4.8616	5.3087
2	3.5	23	69.031	66.131	5.0705	5.4035
3	4	23	66.131	63.329	4.8728	5.1722

Pump Data Form
Study EMD-003/004
Date: 24 oct. 2006

Subject name:
Subject number: 42

Data recorder name: Bill Johnson
Data recorder signature: W K J

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	14	EE 17	105.536	102.882
2				
3				
B. Pump spray, right arm				
1	14	15	102.882	100.629
2				
3				
C. Pump spray, left leg				
1	16	18	100.629	98.249
2				
3				
D. Pump spray, right leg				
1	16	18	98.249	96.012
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	13.5	15	96.012	93.711	4.6763	4.9144
2	16	15	93.711	91.442	4.2782	4.5257
3	16	16	91.442	89.167	4.1201	4.4247
B. Pump spray, right arm						
1	13	13.5	89.167	87.144	4.1955	4.4224
2	13	14.5	87.144	84.836	4.2121	4.4631
3	13	14	84.836	82.904	4.2420	4.4834
C. Pump spray, left leg						
1	14	14.5	82.904	80.793	4.8777	5.0390
2	14	17.5	80.793	78.114	5.0758	5.3158
3	15	20	78.114	75.277	5.0322	5.3275
D. Pump spray, right leg						
1	14	19.5	75.277	72.354	4.9691	52115
2	15	18	72.354	69.613	4.8895	5.1882
3	16	18	69.613	66.896	4.7030	4.9384

Pump Data Form
Study EMD-003/004
Date: 23 Oct. 2006

Subject name:
Subject number: ~~3~~ (FE) WKJ 56

Data recorder name: Bill Johnson
Data recorder signature: WK Johnson

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	5	5	120.649	120.133
2				
3				
B. Pump spray, right arm				
1	7	6	120.133	119.586
2				
3				
C. Pump spray, left leg				
1	4	8	119.586	118.638
2				
3				
D. Pump spray, right leg				
1	4	8	118.638	117.662
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	9	6	117.662	116.947	4.7347	4.8571
2	6	6	116.947	116.379	4.8873	4.9752
3	5	5	116.379	115.739	5.0368	5.0936
B. Pump spray, right arm						
1	4	6	115.739	115.193	5.1226	5.1692
2	4	7	115.193	114.562	5.0289	5.1928
3	3	6	114.562	114.001	4.9414	5.0072
C. Pump spray, left leg						
1	5	10	114.001	113.026	6.4565	6.5533
2	4	10	113.026	112.101	6.5175	6.5706
3	5	11	112.101	111.168	6.4318	6.4772
D. Pump spray, right leg						
1	3	11	111.168	110.292	6.0563	6.1275
2	3	11	110.292	109.353	6.3390	6.4157
3	7	12	109.353	108.140	6.2828	6.3837

Pump Data Form
Study EMD-003/004
Date: 23 October, 2006

Subject name:
Subject number: 9

Data recorder name: Bill Johnson
Data recorder signature: [illegible]

I. Practice Application

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)
A. Pump spray, left arm				
1	8	12	133.538	131.746
2				
3				
B. Pump spray, right arm				
1	14	10	131.746	130.310
2				
3				
C. Pump spray, left leg				
1	10	14	130.308	127.334
2				
3				
D. Pump spray, right leg				
1	9	13	127.334	125.362
2				
3				

II. Pump Sampling

Trial no.	Distance from skin (cm)	No.pumps for full coverage	Container before (g)	Container after (g)	Dosimeter before (g)	Dosimeter after (g)
A. Pump spray, left arm						
1	10	12	125.360	123.593	4.1390	4.4563
2	10	12	123.590	121.848	4.2657	4.5573
3	10	11	121.848	120.279	4.4345	4.6865
B. Pump spray, right arm						
1	8	9.5	120.279	118.876	4.4267	4.6516
2	8	11	118.876	117.305	4.5019	4.7545
3	9	11	117.305	115.756	4.6328	4.9181
C. Pump spray, left leg						
1	12	14	101.810	99.692	5.5169	5.7050
2	12	12	99.692	97.972	5.3602	5.5988
3	12	14	97.972	95.932	5.8392	6.1180
D. Pump spray, right leg						
1	12	15	95.932	93.700	5.7913	6.1552
2	12	16	93.700	91.449	5.8588	6.2350
3	12	14	91.449	89.496	6.0550	6.3569