Chesebrough-Pond's USA Co.
RESEARCH LABORATORIES
TRUMBULL CORPORATE PARK, TRUMBULL, CONNECTICUT 06611

January 25, 1994

Betsy Ullrich
US Nuclear Regulatory Commission,
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Ms. Ullrich:

As per our phone convers n, I am sending you the latest survey results persuant t he close-out of our license #06-11518-01.

The first item is the Scintillation Counter printout from the Aug 1993 area survey. After this time the counter was prepared by Beckman Instruments for transport. The DPMs represent alcohol and water swipes in the following sequence: Background (1), Water Control(1), Users Urine Sample (1), Bench(2), Sink(2), Floor by Sink(2), Floor by Door (2) and Scintillation Counter (2). These surveys were done monthly since the inception of the license.

The second item is the latest results from our dosimetry badge measurements also conducted monthly since the inception of the license and terminated November, 1993.

No radioactive materials have been recieved since August 1991 and no work has been done since that time.

If you have any questions please call me at (203)381-4189.

Best regards,

Richard Hart

5.4 Radiation protection Program
(cont'd)

5.4.1 Monthly Work Area Survey

Monthly swipe surveys are performed in all areas where radioactive materials are used or stored. Filter paper swipes, using both water and alcohol as solvents, are taken off work areas and equipment. These are placed in scintillation vials, a scintillation cocktail is added and the samples are counted in a liquid scintillation counter. Areas which show greater than 10X background are cleaned and re-swiped to insure that proper decontamination has been carried out.

5.4.2 Monthly Radiation Bioassy

Routine (monthly) urine samples are required from all people using radioisotopes.

CALIBRATION SUCCESSFUL MON 12 JUL 1993 07:20

USER: 1 ID:SL DPM STD PRESET TIME: 1.00 MON 12 JUL 1993 07:20
SAMPLE REPEAT: 1 CYCLE REPEAT: 1 SCR:N RS232:N
H#: 1 AQC:N QCF:N RCM:N
CHANNEL 1-LL: 0 UL: 400 2SIGMA: 2.00 BKG SUB: 0.00 BKG 2SIG: 0.00 LSR: 0
CHANNEL 2-LL: 0 UL: 670 2SIGMA: 2.00 BKG SUB: 0.00 BKG 2SIG: 0.00 LSR: 0
CHANNEL 3-LL: 0 UL:1000 2SIGMA: 2.00 BKG SUB: 0.00 BKG 2SIG: 0.00 LSR: 0

SINGLE LABEL DPM SET UP ON 10 APR 1990 14:20

UNKNOWN ID:QC UNKNOWN REPLICATES: 1
UNKNOWN NORM FACTOR ISO1:D 1.00000
UNKNOWN UNITS ISO1:DPM
UNKNOWN HALF LIFE CORRECTION:N
INDIVIDUAL UNKNOWN NORM FACTORS:N BACKGROUND QUENCH CURVES:N
STANDARD ID:QC QUENCH LIMITS LOW:6.000 HIGH:304.0
HALF LIFE(DAYS) ISO1:N
STANDARD DPM ISO1: 152426.0

CAM	POS	CH	CPM	2SIG%	TIME	EL TIME	AVG H#	ERR
1	1- 1	1	49.00	28.57	1.00	1.38	90.0	
		2	70.00	23.90				
		3	84.00	21.82				
	ISO1 %EFF CH1:36.52						ISO1 DPM :134.1740	
2	1- 2	1	39.00	32.03	1.00	2.87	109.0	
		2	66.00	24.62				
		3	84.00	21.82				
	ISO1 %EFF CH1:42.59						ISO1 DPM :91.57417	
3	1- 3	1	123.00	18.03	1.00	4.38	132.0	
		2	148.00	16.44				
		3	164.00	15.62				
	ISO1 %EFF CH1:49.58						ISO1 DPM :248.0800	
4	1- 4	1	43.00	30.50	1.00	5.87	99.0	
		2	74.00	23.25				
		3	92.00	20.85				
	ISO1 %EFF CH1:39.33						ISO1 DPM :109.3436	
5	1- 5	1	54.00	27.22	1.00	7.34	95.0	
		2	74.00	23.25				
		3	96.00	20.41				
	ISO1 %EFF CH1:38.05						ISO1 DPM :141.9122	
6	1- 6	1	47.00	29.17	1.00	8.82	101.0	
		2	62.00	25.40				
		3	90.00	21.08				
	ISO1 %EFF CH1:39.97						ISO1 DPM :117.5785	
7	1- 7	1	41.00	31.23	1.00	10.31	90.0	
		2	51.00	28.01				
		3	69.00	24.08				

ISO1 %EFF CH1:36.52 ISO1 DPM :112.2680

SAM	POS	CH	CPM	2SIG%	TIME	EL TIME	AVG H#	ERR
8	1- 8	1	38.00	32.44	1.00	11.80	93.0	
		2	68.00	24.25				
		3	89.00	21.20				
	ISO1 %EFF CH1:37.43						ISO1 DPM :101.5237	
9	1- 9	1	55.00	26.97	1.00	13.28	92.0	
		2	69.00	24.08				
		3	88.00	21.32				
	ISO1 %EFF CH1:37.12						ISO1 DPM :148.1551	
10	1-10	1	47.00	29.17	1.00	14.76	97.0	
		2	67.00	24.43				
		3	86.00	21.57				
	ISO1 %EFF CH1:38.68						ISO1 DPM :121.4962	
11	1-11	1	46.00	29.49	1.00	16.24	95.0	
		2	62.00	25.40				
		3	86.00	21.57				
	ISO1 %EFF CH1:38.05						ISO1 DPM :120.8881	
12	1-12	1	40.00	31.62	1.00	17.73	93.0	
		2	63.00	25.20				
		3	78.00	22.65				
	ISO1 %EFF CH1:37.43						ISO1 DPM :106.8670	
13	2- 1	1	51.00	28.01	1.00	19.27	95.0	
		2	75.00	23.09				
		3	92.00	20.85				
	ISO1 %EFF CH1:38.05						ISO1 DPM :134.0282	

EXPLANATION AND REMARKS CONCERNING THE REPORT

1. ABOUT THE REPORT

This report lists the deep and shallow dose equivalents for each participant based on the amount of radiation to which the badge or dosimeter was exposed. The premise is that the radiation which exposed the badge is closely related in both quality and quantity to that radiation which exposed that part of the body on which the dosimeter was worn.

2. USE OF CONTROL DOSIMETER

A control dosimeter is included with the shipment of dosimeters as a means to determine radiation doses received during transit, and should be stored in a radiation-free area during the wear period. The control dosimeter reading is subtracted from the dosimeter reading of each participant. Failure to include a control dosimeter with your return shipment of dosimeters will not allow us to assess transit exposure to radiation and such transit doses will be reflected in the participant dose.

3. MINIMUM DOSE EQUIVALENT REPORTED

Dose equivalents for the current monitoring period below the minimum measurable quantity are recorded as "M". The minimum measurable quantity depends on the dosimeter type and quality of radiation. GARDRAY* film and TLD dosimeters have a minimum reporting value of 10mrem for x and gamma rays and 40mrem for energetic beta particles. DEX-RAY* film dosimeters have a minimum reporting value of 5mrem. All fast and moderate energy neutron dosimeters have a minimum reporting dose of 20mrem. Film dosimeters for thermal neutrons have a minimum reporting dose of 10mrem.

4. CUMULATIVE TOTAL DATA

Cumulative totals equal the sum of the readings of dosimeters returned for processing and reported to date. Minimal exposures are added as zero. Calendar quarters are selected to most nearly conform to NRC and state recording requirements considering starting date and length of monitoring periods chosen.

5. ADJUSTMENTS TO CUMULATIVE DATA

To aid in proper presentation of information for records required by the NRC and other regulatory bodies, amendments to the cumulative totals may have been made increasing or decreasing the totals from those originally reported. Such amendments are made at the request of an authorized representative of the client and are only to reflect supplementary data demonstrating that the dosimeter exposure originally occurred in such a manner as to either overstate or understate the true dosage to the badge assignee. (Refer to adjustment column.) Addition of previous exposure prior to commencement of use of the particular dosimeter assignment reported may also be reflected in the cumulative totals.

6. DEEP AND SHALLOW DOSE EQUIVALENTS

The deep dose is the dose equivalent from all radiations at a depth of 1cm (1000mg/cm²) in soft tissue. Considered are the effects of build up and attenuation of radiation in the body as estimated using the 30cm diameter sphere of tissue equivalent material specified by the International Commission on Radiation Units and Measurements. The shallow dose equivalent is the dose equivalent from all radiations at approximately 0.007cm depth (7mg/cm²) in soft tissue. Similar to deep dose, the contributions to the shallow dose equivalent from radiation scattered within the body is considered. The deep dose should be considered equivalent to the whole body dose and the shallow dose as equivalent to the dose to the skin of the whole body.

Dose equivalents arising from exposures to x or gamma rays will have a deep and shallow value reported. Depending on the energy of the x or gamma rays, the deep and shallow values may or may not be equal. For neutron exposures, the same value is reported for the deep and shallow dose equivalent. Beta exposures are only reported as a shallow dose equivalent.

When the lens of the eyes are not sufficiently protected from radiation, NRC Form 5 states that doses at 300mg/cm² or less should be measured. When dosimeter data indicate that reporting the dose at 1cm depth would not reflect the appropriate dose at 0.3cm depth (300mg/cm²), the deep dose reported will be the dose at 0.3cm depth rather than at 1.0cm depth.

7. RING BADGE READINGS

Ring badge readings are reported as a shallow dose as if due to gamma rays. If produced by low energy x-rays or beta particles, the reported value may be incorrect. Calibration factors for x-rays and beta particles are available so that a more accurate interpretation is possible.

8. GENERAL RADIATION EXPOSURE GUIDES*

TYPE OF EXPOSURE	GUIDE VALUE
Whole body; head & trunk; blood forming organs; lens of eye; or gonads	1250 millirems per quarter. 5000 millirems per year. Up to 3000 millirems is permitted in a calendar quarter as long as the accumulated occupational dose to the whole body does not exceed 5000 millirems x (age-18).
Skin of whole body	7,500 millirems per quarter
Hand, forearms, feet and ankles	18,750 millirems per quarter

*U.S.N.R.C. regulations, Title 10, Part 20, Code of Federal Regulations (9-1-78). NOTE: Certain states and other regulatory agencies may follow guides that are different from the above.

COLUMN REFERENCES

NOTES (COLUMN 4)

A ABSENT

B-1 This film appears to have been damaged by light. The accuracy of any reading given would be affected thereby.

B-2 This film appears to have been damaged by moisture. The accuracy of any reading given would be affected thereby.

B-3 This film appears to have been damaged by chemical fogging. The accuracy of any reading given would be affected thereby.

B-4 This dosimeter appears to have been manufactured faultily. The accuracy of any reading given would be affected thereby.

B-5 This film appears to have been damaged by heat or pressure. The accuracy of any reading given would be affected thereby.

C Evidence of contamination.

DA This film packet appears to have been exposed out of the badge, therefore, the value given is based on a high energy gamma calibration and is valid only if the exposure were due to high energy gamma. If it were due to beta particles, or lower energy x or gamma rays, the value reported may be inaccurate.

DC This film packet is partially lightstruck. There is apparently a dose recorded, however, no exact quantitative determination can be made. The reported dose is the maximum received.

DD This film badge appears to have been shielded during exposure. The dose reported is not an exact quantitative determination, but only an indication that the badge was exposed.

DE This film badge appears to have been shielded during exposure. No quantitative determination can be made.

DF This film packet appears to have been misplaced in the badge. The dose reported is not an exact quantitative determination, but is only an indication that the badge was exposed.

DG Although this film packet was slightly lightstruck, there seems to be no apparent effect on the reading.

DH The beta-gamma background on this film badge was too high to give a valid fast neutron reading.

DI This reading is based on 50-150KV x-ray. This film badge appears to be defective, please return holder for replacement.

DJ This film packet is too old to process.

DL This control packet appears to have been placed in a badge holder, indicating possible misuse. May we remind you that the value of the control films is lost if used for personnel monitoring or other radiation measurement purposes.

DR This film appears to have been exposed from the rear of the badge.

DS Amounts shown in columns 8 & 9 have been permanently subtracted from cumulative totals at customer's request.

DT Amounts shown in columns 8 & 9 have been permanently added to cumulative totals at customer's request.

DU Amounts shown in columns 8 & 9 have been supplied by customer for period prior to inception of Landauer service and have been permanently added to cumulative totals.

DV Amounts shown in columns 8 & 9 are previous lifetime exposures supplied by customer and have been permanently added to cumulative totals.

DY Other comment - See attached note.

DZ Other comment - See attached note.

E Irregular exposure.

E-1 Due to the irregular exposure the effective energy cannot be properly determined and the dosage is estimated arbitrarily based on 50 to 150 PKV x-rays as probable source of exposure. If different energy, the value reported will not be the actual dosage.

E-2 Due to the irregular exposure the effective energy cannot be properly determined and the dosage is estimated arbitrarily based on gamma or x-ray over 40GKeV as probable source of exposure. If different energy, the value reported will not be the actual dosage.

H Unused.

QC Dosimeter received and processed. Quality control has not authorized reporting of doses. A separate report containing the doses for this dosimeter will be forthcoming.

DOSIMETER TYPE USED (COLUMN 5)

A X, GAMMA, BETA, FAST NEUTRON (NEUTRAK I)
B X, GAMMA, BETA, FAST NEUTRON (NEUTRAK IIA)
C X, GAMMA, BETA, FAST NEUTRON (NEUTRAK IIA), THERMAL NEUTRON
D REACTOR TLD
E NEUTRAK I
F TLD (4 CHIPS), FAST NEUTRON
G X, GAMMA, BETA
H X, GAMMA, BETA, FAST NEUTRON (NTA FILM), THERMAL NEUTRON
I NEUTRAK I (TYPE I DISC) & NEUTRAK IIA
J X, GAMMA, BETA, FAST NEUTRON (NEUTRAK I), THERMAL NEUTRON
K TLD (4 CHIPS)
L TLD (4 CHIPS)
M TLD (3 CHIPS)
N FAST NEUTRON (NEUTRAK IIA)
O TLD (1 CHIP) FAST NEUTRON (NEUTRAK I)
P X, GAMMA, BETA, FAST NEUTRON (NTA FILM)
Q DEX-RAY
R X, BETA, GAMMA, NEUTRON (NEUTRAK IIA) (FILM)
S X, BETA, GAMMA, NEUTRON (NEUTRAK IIA) (TLD, 3 CHIPS)
T TLD (2 CHIPS)
U TLD (1 CHIP RING)
V X, BETA ONLY (TLD CARD ONLY)
W ESCORT II TLD
X SPECIAL TLD
Y X, GAMMA, BETA, THERMAL NEUTRON
Z TLD (3 CHIPS), FAST NEUTRON (NEUTRAK IIA)
OPTION CODE (WHEN USED)
1 ADDITIONAL BETA CALC. & COMBINATION HOLDER
2 ADDITIONAL BETA CALC.
3 COMBINATION HOLDER
4 X, CALCULATION FOR RING
* NOT SUBJECT TO NVLAP ACCREDITATION

RADIATION QUALITY (COLUMN 7)

The following codes are provided to identify the ty
some cases, energies of radiation contributing to the d
sient.

P - x or gamma ray exposure. P may be followed by an
energy x or gamma rays (greater than 250 keV effec
moderate energies (between 100 and 250 keV effecti
low energies (less than 100 keV effective).

B - Beta particle exposure.

N - Neutron exposure. N may be followed by an F fo
intermediate energy neutrons or a T for thermal neutron

CPB - Combined exposure due to both x or gamma-rays
particles. The beta particle dose will be printed as a s
in the shallow dose column and coded as B, indicatin
second line is the beta dose component of the
shallow dose.

CPN - Combined exposure due to x or gamma rays and ne
neutron dose will be printed as a second line in the
column. This line will be coded as NF or NT, indicatin
second line is the dose due to fast and intermedi
neutrons or thermal neutrons, respectively.

ADJUSTMENTS (COLUMN 16)

Adjustments made to cumulative totals with this
ous report at customer request.

A - Additions
B - Subtractions
C - Additions & Subtractions
D - Dosage data supplied by customer for period pr
ception of Landauer service.
E - Dosage data supplied by customer for period pr
ception of Landauer service; additional changes
been made.
F - Previous lifetime exposure supplied by customer.
G - Previous lifetime exposure supplied by customer;
al changes have also been made.

UNUSED PERMISSIBLE ACCUMULATED DOSE (COLUMN 17)

Unless birth date and lifetime exposure records are si
the customer, no values are reported in column 17. If
is supplied, the difference between the participant
years) and 18 (if age greater than 18) is multiplied
From this, we subtract the value shown in column
result is that value given in column 17. [5000 (Age-1
14]. The value in column 17 is computed monthly. Pr
values are based on January 8, 1957, recommendatio
National Committee on Radiation Protection and
ments. These values are given for total body exposu

INCEPTION DATE OF PERMANENT TOTAL (COLU

Available to client modification to meet specific adm
requirements and may not reflect actual beginning d
cumulated totals.

LANDAUER

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