

H-DIVISION PROGRESS REPORT

February 21, 1962 - March 20, 1962

I. ADMINISTRATION (Thomas L. Shipman, M.D., Leader)A. General Remarks1. Biology and Medicine

Operation of Los Alamos Improved Liquid Scintillation Whole-Body Counter (Humco II).

The Bio-Medical Research Group's improved 4 liquid scintillation whole-body counter (Humco II), which has been under design and construction for the past three years, is now in full operation. Improvements over the previous model are about a factor of 15 to 20 for Cs¹³⁷ and I¹³¹. In addition it is now possible to determine pure beta-emitting nuclides such as Sr⁹⁰ and P³² by means of bremsstrahlung at levels below 0.1 microcurie. These were not detectable with the old counter. The improvements result primarily from the use of 16-in. diameter multiplier phototubes which permit a great increase in optical efficiency, and from increasing the thickness of the liquid scintillator to 12 in., a value indicated as optimum by Monte Carlo calculations. The improved resolution and increased energy range of the new counter make it possible to determine quantitatively as many as six nuclides simultaneously. This capability is especially important in animal experimentation on retention of radioactivity, since it permits a significant saving in the time and effort devoted to animal care and measurement. To handle the increased burden of data processing resulting from multichannel operation, the instrument is supplied with automatic data recording and processing systems. All results, including coded information identifying and describing the subject, are recorded directly on IBM cards which are then processed by an IBM 7090 computer. The computer programs extend to fitting excretion curves with multiple component exponential functions and computer plotting of primary data and least-squares functions.

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B. Personnel (3/1 - 3/31/62)

1. New Hires

3/5	HANNERS, John L.	H-DO	Property
3/16	ATENCIO, Jose E.	H-4	Mammalian Radiobiology
3/28	COURTRIGHT, Mary	H-2	First Aid

2. Terminations

3/5	BENSON, Robert N.	H-1	CMB Monitoring
3/9	LUJAN, Elisandro N.	H-DO	Property
3/15	GARRITY, Ralph B.	H-7	Laboratory (Casual)
3/16	LANGHAM, Paschal T.	H-1	CMB Monitoring
3/23	LANG, Ann D.	H-2	First Aid (Casual)

3. Total Personnel

SM	73
Military	1
SCP	110
ASC	<u>56</u>
	240*

*Includes 15 casuals

IV. GROUP H-1, HEALTH PHYSICS (Dean D. Meyer, Leader)

Group H-1 has assisted H-6 in a study of the energy dependence of ionization chamber survey instruments. The results have been written as a LA Report, which is now being processed. Assistance was also given to K Division in determining the number and location of area alarms, air monitors, portal monitors, and hand and foot counters for the core test facility at Ten Site.

A health physics lecture was given at Ten Site to the reactor operating personnel. The lecture covered the monitoring information these men will need to know on off-shifts.

A neutron survey at DP west was made to study the neutron energy from PuF_4 and to determine a factor to apply to portable survey instruments being used in this area. A LAMS Report is being prepared on this survey.

CMB-11 is remodeling Room 201 at DP West. This work has required the removal of a large amount of highly contaminated equipment. By close cooperation between H-1, CMB-11, and Zia crafts, this work was done with a minimum spread of contamination and exposure to personnel.

Fifty-four LAMPRE I plutonium fuel elements were transferred from Ten Site to Wing 9 without incident. Eight elements reading 20 r/hr at 1 meter were moved at a time, using a uranium shield. The highest dose received was 60 mrem.

On March 19th a potential radiation incident was discovered at Ten Site in time to prevent it from becoming serious. At 10:00 a.m. Room 128 was given a routine alpha check, and found to be clean. At noon, the operators detected activity on their laboratory coats when they checked out for lunch. High level activity was found in the room, which was traced to a cracked plastic bottle in which a plutonium metallurgical specimen was stored. The area has been decontaminated, and new storage facilities provided for the specimens. Urine assays have been scheduled for the personnel.

Much time was spent monitoring and decontaminating Shop 4 in SM-39. Some time ago the method-X machine was moved into Shop 4 and used on small pieces of tuballoy and oralloy. When the program was started, no trouble was encountered from radioactive contamination. Recently, with an increase in quantity of material, we began to find contamination on the equipment and the men's clothing. This month it was decided to move the operation to Shop 13, where protective clothing and rad-safe surveys are routine. The move required monitoring all equipment that had been used, and decontaminating the area.

At DP Site GMX-7 has performed some detonations involving tuballoy. The operation was checked for radiation health problems.

Air samples taken five minutes after detonation were approximately one-tenth the MPC; the walls of the chamber are contaminated, but the material does not become air borne. On the basis of our tests, GMX-7 was told to go ahead with their program.

III. GROUP H-3, SAFETY (Roy Raider, Leader)

<u>A. Accident Record</u>	<u>1/1/62 to 3/1/62</u>	<u>1961</u>
Manhours Worked	1,067,985	6,460,919
Number of Disabling Injuries	4	16
Number of Days Lost	84	18,233
Frequency (Accidents/1,000,000 Manhours)	3.8	2.5
Severity (Days Lost/1,000,000 Manhours)	79	2,822

B. Industrial Accident Experience

There were no lost time accidents during this report period.

C. Fires

There were no fires at the Laboratory during this report period.

<u>D. Motor Vehicle Accidents</u>	<u>1/1/62 to 3/1/62</u>	<u>1961</u>
Miles Driven	288,670	1,706,232
Number of Accidents	4	20
Rate (Accidents/1,000,000 Miles)	14	12
Total Cost	\$621.00	\$1261.00
Accident Cost/100,000 Miles	\$215.00	\$74.00

There were three Government vehicle accidents during February involving Laboratory drivers. One occurred while the driver was backing, one occurred when a vehicle skidded on ice and hit a fence, and the other occurred when a LASL driver made a left turn and struck a private vehicle.

E. General

1. H-3 and GMX-DO are continuing the SOP review of GMX-7 procedures for HE work.

2. The following films were shown during this report period:
 - a. "It's Up to You" shown two times.
 - b. "Shop Safety" shown three times.
 - c. "Ten Long Minutes" shown two times.
 - d. "See a Pin" shown one time.
 - e. "Flammables Engineering" shown twenty-four times.
3. "Some Aspects of Beach and Water Safety" was reproduced and distributed to Dominic personnel
4. Approximately 400 gallons of diethyl ether were disposed of without serious incident. The ether had been in stock many years and there was concern over the formation of peroxides.
5. An NTS Yucca Safety Manual is in preparation and portions will probably be distributed within a month.
6. This office is working closely with J-Division in planning for the Pacific Operation. James G. Stearns left Los Alamos on March 3rd to be in residence at Christmas Island as the TU 8.1.1 Safety Advisor for approximately a month.

IV. GROUP H-5, Industrial Hygiene (Harry F. Schulte, Leader)

A. Evaluation and Control Work

1. Beryllium

A total of 47 air samples and 4 swipe samples were collected in the beryllium machine shop during this period; two of these were slightly above and others were well below permissible air concentrations. Other air and swipe samples were collected in the Quality Control Section of SD-4, in N-2, and in P-4. All samples were below permissible levels.

2. Enriched Uranium

Room air and stack air sampling was continued in the test cell at TA-46. One room air concentration was slightly above permissible levels and all other samples were well below such levels.

In Shop 15, 29 breathing zone air samples were collected, of which several were above permissible levels. This study is continuing in collaboration with Group H-1. Additional measurements are being made to evaluate the factor of resuspension of settled dust particles.

3. Trichloroethylene (TCE)

Four air samples were collected for TCE vapor during operation of the degreaser in the plating shop at TA-22. All 4 of these samples were very close to the maximum permissible concentration of 100 ppm. Additional studies will be made on this equipment.

4. Carbon Monoxide

Air samples for carbon monoxide were collected at a firing pit of GMX-6 at Ancho Canyon immediately after a shot. These samples showed concentrations of 300-600 ppm; however, within 5 minutes the carbon monoxide was cleared out of the pit by natural ventilation.

5. Fallout

Air sampling for fallout continued on a weekly basis with very low levels being detected. Since the iodine concentration in milk samples is now below detectable levels, this sampling program will be discontinued until shortly before testing is resumed.

6. Noise

Impact noise level measurements were made in the vicinity of the rolling mill at the new Sigma Building. The levels found were appreciably above tolerance levels for this type of noise and ear protectors have been issued to personnel. Another noise survey was carried out in the Plasmatron Room of the new Sigma Building, and these operators have now been scheduled for regular audiometric testing by Group H-2. Work is continuing in an attempt to reduce the noise level due to the exhaust ventilation system in the graphite machine shop. A reduction of 3 db has been obtained by the use of adaptors on the ends of the ducts.

7. Respirators

Twenty-two persons were fitted with respirators in the test chamber during this period. An improved respiratory protective program has been discussed with Group CNP-5 and all individuals in that group are now being fitted with appropriate protective equipment.

Two hundred and four respirators that had been cleaned and presumably repaired were inspected at various locations throughout the Laboratory. Of these, 14% were found to be unsafe for use; a detailed respirator maintenance program was drawn up and submitted to SP Department and H Division. Recommendations have been made that respirator cleaning and maintenance be transferred to Group H-1.

8. Ventilation

Work is continuing with Group H-1 in Shop 15 to improve the exhaust ventilation system as well as the air sampling system in this area. Ventilation hoods have been checked at W Site, Graphic Arts, and S Site. Six sets of plans involving ventilation have been reviewed and approved during the month. Modifications of ventilation systems have been discussed with personnel at S Site and TA-4B.

An investigation was started to determine the size distribution of the dust in the exhaust stack from the RaLa cell at Ten Site. Air samples have been collected from the exhaust stack using the aerosol spectrometer and millipore filters. A preliminary analysis indicates that a large portion of this aerosol is larger than 1μ , indicating that the high efficiency filters may be defective or the bypass valve may be corroded. Additional work will be done on this system.

B. Research and Development

1. A study has been completed on the effect of long-term (up to 6 weeks) storage of refrigerated urine on plutonium recovery. No loss of plutonium has been detected.

2. Analyses of autopsy tissues for uranium and plutonium are continuing. There is little evidence of any build up of plutonium in the tissues of unexposed persons as a result of fallout as had been reported elsewhere.

3. A study of the behavior of plutonium on anion exchange resins has progressed to the point where substitution of an ion exchange step for the present solvent extraction in the routine plutonium procedure is being considered. Such a change has numerous advantages. A similar study is being made on uranium.

4. A study in co-operation with Group H-4 is being planned on the lung retention and tissue solubility of uranium carbide, using experimental animals.

5. Particle sizing for the purpose of calibration of sampling cyclones for spherical particles has been resumed.

6. A special filter media, using paper impregnated with silver nitrate, has been prepared and is being tested as a sampling medium for iodine on the Omega stack.

C. Miscellaneous

A large case is being prepared which will be completely equipped with safety equipment necessary for working in areas with limited egress. This will be shipped to the Nevada Test Site for use by the Safety Group there. This will include a safety belt, a life line, a low voltage light, etc.

The low background alpha counters now being used by the Laboratory Section have about reached the end of their normal life. A new compact instrument for this purpose has been developed by P-1. The first model will be tested soon, and, if successful, eight units will be prepared for use by the Laboratory Section.

The supply of LA-1858, "Analytical Procedures of the Industrial Hygiene Group", which was available through the Office of Technical Services, has been exhausted and many requests for copies are still being received. Since there have been numerous changes in our present methods, and new methods have been developed, a start is being made on preparing a new edition of this report.

D. Statistical Summary

1. Air samples collected or field tests made for:

Beryllium, air	58
Beryllium, swipes	25
Beryllium, miscellaneous (oil, chips)	3
Carbon Monoxide	2
Trichloroethylene	4
Enriched Uranium, air	55
Enriched Uranium, smair*	14

2. Sanitation

Water samples collected	17
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3. Plans Approved

6

4. Analyses Completed

Air

Beryllium	59
Uranium alpha activity	8

Biological (urine)

Americium alpha activity	7
Cadmium	2
Gross beta activity	1
Lead	12
Plutonium alpha activity	304
Thorium alpha activity	5
Trichloroacetic acid	9
Tritium	43
Uranium (fluorescimetric)	83
Uranium alpha activity	179
Mercury	16

Miscellaneous

Beryllium in metal samples	3
Beryllium in oil	1
Beryllium on swipes	27
Plutonium alpha activity in tissue	32
Radioiodine in milk	4
Uranium in tissue (fluoresc.)	16
Uranium in water (fluoresc.)	44
Solvent content of proprietaries	33

*Smear + air

V. GROUP H-6, RADIOLOGICAL PHYSICS (Harvey I Israel, Leader)

A. Special Problems (S. Shlaer)

1. Work in Progress

a. The electronic logic chassis and densitometer have been obtained from P-1. However, it is not yet operating properly in that it does not cycle properly to read out densities. It may not be possible to correct the trouble until W. Steger of P-1 returns from a trip.

b. Measurements to determine whether the pulse height is a linear function of the energy in NaI(Tl) crystal are still continuing. Characteristic K radiation of elements are still being used as sources, but it was found that several elements could not be irradiated at the same time without producing shifts in the pulse heights. At the present counting rates, the spectrometer system appears to be quite stable. Pulse height versus energy measurements from 8 to 93 Kev have been made with a NaI (Tl activated) crystal, irradiating two elements and then one element at a time with similar results. The response of the NaI (Tl) crystal appears to be non-linear to photons. After correcting for non-linearity of the electronics, the response is about 8 per cent higher at 40 Kev than at 93 Kev and the response is about 10 per cent lower at 8 Kev than at 93 Kev.

c. Some initial preparation of a talk on "The Health Physicist and Civil Defense" to be given by E. Bemis at the annual Health Physics Conference in June was made so that an abstract could be written and submitted.

2. Work Completed

a. The 400 channel analyzer belonging to H-1 was set up in the H-6 x-ray room in order to make spectrum measurements and to make intrinsic efficiency measurements on various scintillator. Adjustments and checks on the linearity of the system were made with the help of P-1 personnel.

b. The gamma-ray spectrum emitted by a device at S-Site was determined with the H-1 400 channel analyzer which was taken out to the site and set up. The neutron flux was simultaneously measured with several types of instruments by H-1. The purpose of these measurements was to try to explain the discrepancies in results obtained by various instruments.

c. Aid was provided to P-1 and H-1 in some problems of radiation measurement with thimble chambers at the GMX-11 Phermex machine. One of the primary difficulties was that the thimble chambers being used were unknowingly being irradiated by some of the electrons of the beam rather than by x-rays alone.

d. Don McKown of Group H-1 and E. Storm have completed a report describing the energy dependence of survey instruments.

B. Weather Section (O. W. Stopinski)

1. Work in Progress

- a. Work continues on the local climatological study.
- b. Work continues on computing fallout statistics on various communities around the state.
- c. A study of the hazards involved with the accidental release of radioactive material into the atmosphere from UHTREX under various meteorological conditions is in progress.

2. Work Completed

- a. Section personnel supported J-Division activities at NTS, as well as the Bayo Canyon operation March 6.
- b. W. Sayer and Payne Harris met with personnel from the Becktol Corporation Mary 6, to discuss effluents from Kiwi type reactors and how they would affect design criteria for the National Reactor Test Station at NTS.
- c. Minor climate studies were made and forwarded.

C. Environmental Radiation Section (W. R. Kennedy)

1. General

a. None of the alpha particulate air samplers during the month gave values in excess of 0.4×10^{-14} $\mu\text{c}/\text{cc}$.

b. Beta-gamma activity in air has decreased while precipitation activity has increased. Seventh day counts were:

	<u>Average</u>	<u>Maximum</u>	<u>Date of Max.</u>
Air	5.60×10^{-12} $\mu\text{c}/\text{cc}$	10.5×10^{-12}	3/8 - 3/9
Water	931.5 $\mu\text{c}/\text{cc}$	2460 $\mu\text{c}/\text{cc}$	3/13 - 3/14

c. The continuously recording gamma rate meters indicated a few short time rises, which correlate with the Omega stack gas activity.

d. Both moving tape air particulate monitoring instruments are back in operation. Both indicate the arrival of short half lived active material for short periods of time during the month. On each occasion, wind direction was from the Omega stack.

2. Laboratory

a. Waste from CM Building was routinely assayed for excessive alpha activity. All batches were released to H-7 for disposal.

b. Drinking water at DP West and at CM Building showed no plutonium. Circulating water at CM Building showed no plutonium. Circulating water at DP West continues to show trace amounts of plutonium with no significant change from last month's values.

c. Procedures and techniques for uranium analysis using the Turner fluorimeter have not been perfected. Results have been erratic. The trouble seems to be in achieving a uniform flux for making the pellets used in the analysis.

VI. GROUP H-7, INDUSTRIAL WASTE (C. W. Christenson)

A. Plant Operation

1. TA-45, Tech Area

Operations were essentially normal at all plants during the month. Improvements planned for the operation of the americium plant include the installation of an electric trolley and hoist for handling drums, the insulation of the chemical storage room, and installation of another neutralization tank. We are still trying to get a cement storage silo. The use of cotton filter plugs for effluent turbidity measurements at DP West have been instigated. This test should give better control of plant operation. Consideration is being given to the possible use of a burner in the disposal of T.B.P. wastes now being stored in DP Area.

2. TA-50, Central Treatment Plant

Black and Veatch estimated on March 1, 1962, that 26% of construction was accomplished; this is slightly ahead of the schedule.

3. TA-1, Delta Building - Tunnel Kiln

The kiln has been operating continuously since February 26. The heating portion has been fairly satisfactory but the kiln was out of operation for two days to replace one of the controlling magnetic amplifiers.

The hydraulic system for all car movements in the kiln has not been without fault. Our best sustained run has been two and one half days. Trouble comes from the main hydraulic system losing pressure which causes the pump to start and stop excessively, faulty rings in a gas accumulator, and leaks in the external oil system. Some cars have jammed in the entrance and exit chambers of the kiln.

Oil leaks occurring at the entrance chamber caused the latest shutdown. The hydraulic fluid will be changed to a fire resistant type. The automatic sprinkler heads, located near the ceiling, are being checked by the Fire Department.

Soaking and Drying Equipment

Serious leaks in this system have caused a complete shutdown. Several alterations will be required before a satisfactory run can be expected. Piping changes may be required to decrease drying time and extra heating capacity may be required. Because the design is new and untried, the trial and error method seems our only solution.

U. S. Geological Survey Program for FY 1963

Representatives of the U. S. Geological Survey, Ground Water Branch, Albuquerque; AEC representatives of LAAO and ALOO; H-6, and H-7 held two meetings at Los Alamos to map out a program of future operations for the Geological Survey in Los Alamos. Work in the past has covered the overall environmental studies, mainly by sampling test wells, springs and streams as well as soils in the canyons. This was followed by special selected studies to follow waste and water flow through tuff and associated fissures in the zone of aeration.

An extensive program was started in Mortandad Canyon when the site of the TA-50 central waste treatment plant was selected.

For FY 1963, it has been agreed that the extensive water and soils collection program will be taken over in part by LASL personnel. The backlog of data from routine sampling and special studies will be submitted in reports this year and next.

Mortandad Canyon will receive a high priority, with emphasis again on reporting results at more frequent intervals than in the past.

Special problems that require the Survey's skills will be requested by LASL or AEC as the need arises.

A special program to study water and waste travel at Jackass Flats was started in 1959 in connection with a sub-surface disposal tile field serving the radioactive wastes from washdowns in the M.A.D. Building. U.S.G.S. assistance may be requested on this program.

B. Laboratory Section

1. Routine Laboratory

Some consideration has been given to detonating the Bayo shots underground. For this reason it was deemed advisable to determine the amount of radioactive strontium in the sources used and to determine the relative abundance of Sr^{89} and Sr^{90} . Two samples were obtained from CMB-DO-GS. Results of analysis indicated that there was about 1 mc of radioactive strontium per 5,000 curie source. Over 95% of this radioactive strontium was Sr^{89} .

2. Ceramic Sponge Studies

A porous ceramic shape supplied by Wisconsin Porcelain Company has been tested for ability to sorb and retain waste. Although the porosity is somewhat greater than the Coors ceramic, the pore structure of the shape from Wisconsin is such that waste is not retained. It may be possible for the Wisconsin group to use a different burnout material, or grind the present burnout material, so as to obtain smaller pores when the ceramic is fired and thus increase its tenacity for the waste. In its present form, it appears unsatisfactory for use as a ceramic sponge.

The installation of a larger tube furnace and a slight modification in the drying chamber have reduced the time required for drying ceramic shapes in the laboratory apparatus by a factor of three. Stability of the shape and volatility of ruthenium will be determined under the new conditions.

3. Inorganic Ion Exchangers

Salts of zirconium and molybdenum as inorganic ion exchangers are being investigated for their ability to sorb uranium, plutonium, and americium; ammonium molybdophosphate has the ability

to sorb the three nuclides; excess salts may be washed from the column and the nuclides later eluted. In this way, a clean sample may be prepared for Frish Grid alpha analysis.

4. TNT Studies

The amount of TNT being fed to the degradation tank has been doubled. There has been no deleterious effect to the population thus far, however, some increase in residual TNT is being noted. Increasing rates of feed will be attempted in order to establish the maximum allowable concentration.

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