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*JB 6/10/53*

H-DIVISION PROGRESS REPORT  
July 20 - August 20, 1955

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REF: H-216

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OS-6 *JB 7/26/54*

I. ADMINISTRATION (Thomas L. Shipman, M. D., Leader)

A. General

On August 3, the Laboratory suffered what was undoubtedly its most serious contamination incident. A mock fission polonium source containing 25.2 curies exploded in the basement room of the Physics Building which contains the graphite pile. Two men who were in the room at the time were quite heavily contaminated and varying amounts of contamination were spread almost throughout the building. About 150 people in the building were subjected to contamination and were monitored before being released. Eighty-four of these lost one or more articles of clothing, at least temporarily, and several people required showers. At the close of this report period, August 20, decontamination procedures are still continuing, although the majority of the building is occupied and in at least partial operation. At this time, it appears that only the two men in the room at the time of the explosion absorbed significant amounts of polonium. Further study will be required before the actual body burdens can be calculated with any degree of confidence. Most of the decontamination should be completed during the next report period, at which time a more complete summary will be given.

B. Personnel:

1. New Hires

8/4	STOPER, John B.	H-4	Radiobiology (Ret. fr Mil. Leave)
8/15	REX, Elgin H.	H-7	Laboratory
8/15	VIGIL, Joe A.	H-1	DP West Monitoring
8/30	MARTINEZ, John P.	H-1	General Monitoring (Limited)
8/31	RICHMOND, Chester R.	H-4	Radiobiology

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For *Philip Drang*  
(Person authorizing change in classification) (Date) *6/10/53*  
By *John A. DeLoach*  
(Signature of person making the change) (Date) *6/10/53*

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2. Terminations

8/5	SKILLMAN, Clarence P.	H-5	Test Operations	
8/5	DAYHILL, Melvin D.	H-DO	Property	(SUMMER)
8/26	BEHL, Ruth E.	H-4	Radiobiology	"
8/26	CRAIGHEAD, John E.	H-4	Radiobiology	"
8/26	WONFLEET, Robert G.	H-4	Radiobiology	"
8/26	FORBMAN, W. Wayne	H-5	Laboratory	"
8/30	SMITH, Frances J.	H-7	Administration	"
8/31	THRATCHER, Lawrence D.	H-4	Radiobiology	"

3. Total Personnel

SM .....	53
Military .....	3
RA .....	15
SCP .....	87
Military .....	1
ASC .....	32
TOTAL ..... 191*	

\*Includes 5 casuals, 5 summer, and 1 temporary.

II. GROUP H-1, MONITORING (Dean D. Meyer, Leader)

A. General

George Littlejohn covered the monitoring of Inyokern activities between July 18 and July 27.

B. Incidents:

1. At 9:30 a.m. on July 29, [redacted] of P-3 removed 63.88 grams of unrefrigerated plutonium metal, supposedly encased in a nickel shell, from his safe in Room E-119 of the SM-40 Physics Building and proceeded to remove it from its cheesecloth and plastic container. He found the nickel shell had deteriorated completely and the plutonium appeared to be in the brown oxide form. [redacted] left the room immediately following this observation, locked the door and notified Health Division personnel. Fortunately, [redacted] had no contamination on his person or clothing. An H-1 representative removed the residue to a coffee can approximately one hour after the incident and

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 Per *Philip Dary*  
 (Personnel In; Date in Classification) (Date)  
*Glenn Nelson 6/27/78*  
 (Signature of Person making the change, and date)

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swabbed the area, so that the maximum amount of material could be sent to recovery and thus reduce the amount of contamination spread. As it was, all of the horizontal surfaces of the one room had some general contamination up to 2000 c/m with peaks of greater than 20,000 c/m on the desk top. The person removing the original residue did receive contamination of 10,000 to 15,000 c/m on the forearm and right shoulder and 800 c/m on the back of his neck, all of which was readily decontaminated to tolerance. Nose counts taken on [REDACTED] were 16 c/m. The first urine samples taken resulted in an insignificant count. Thorough decontamination for the following 3 1/2 days reduced the direct count to 250 c/m or less, including the safe drawer from which the material was taken. The room windows were closed at the time, and with the door allowing the only ventilation, no activity got outside of the room. The air sample read 4.2 d/m/M<sup>3</sup> during cleanup.

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\_\_\_\_\_ of P-4  
(Source authorized \_\_\_\_\_ in writing, (Date) \_\_\_\_\_)  
By \_\_\_\_\_ 6/15/78  
\_\_\_\_\_ (Name, Title, and date)

2. On August 3, at 3:00 p.m. [REDACTED] noted a rise in counting rate from a 25.2 curie mock fission plutonium source situated in the graphite pile located in [REDACTED] of the Physics Building, SM-40. They removed the source to a sponge rubber padding and made a dry swipe test with negative results. A PeeWee probe was then held over the source for a direct count. At that instant the capsule, which consisted of a platinum shell with a nickel coat, exploded upward into the probe and into the sponge rubber pad. Both individuals left the area immediately and notified Group H-1 of the accident.

One hundred fifty people in the building were subject to contamination and required a survey prior to their departure for home. Eighty-four persons lost one or more articles of clothing; several people required showers.

The power was shut off at approximately 4:10 p.m. until individual ventilation systems of the west wing could be shut off, and barricades and

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air draft seals were established. During this time the source residue was packaged to prevent additional spread.

Contamination of most of the personnel was reduced to tolerance levels; however, two or three individuals who were most intimately involved had areas around the mouth or nose, eye or back of neck that still read 15,000 c/m after vigorous decontamination.

Spot surveys indicated activity up to 20,000 c/m throughout the entire building. Decontamination and monitoring commenced the evening of the incident and have continued night and day, including week ends, through the date of this report.

Urine samples indicated a maximum of 2 1/2 times tolerance for [redacted] with five other individuals showing an excess of tolerance in lesser degrees, and three individuals had just a tolerance dose.

By Monday a.m., the 5th day after the accident, most of the personnel could return to work in the north, east and south wings. No activity reached homes or personal vehicles; however, a few Government vehicles were contaminated.

Window screens, ventilation filters and dust precipitators were pulled for steam cleaning. Exhaust ducts and blowers were removed completely from two rooms, and filters were placed over the exhausts of many other rooms for a check on recirculation of activity. Air samples for the area never exceeded a maximum of 3 times tolerance and have since been maintained below tolerance.

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On August 20, two leaking ~~Na-22~~ sources were found in Room W-128.  
(Person authorizing change in classification) (Date)

A cleanup proceeded and the sources were placed in plastic. *Philip Lang* 6/5/78

(Signature of person making the change, and date)

3. On July 29, a leaky tritium source was detected in Day's Canyon just prior to detonation. A reading of 3 on 3 scale was detected. The source was repackaged and returned to DP East. No personnel overexposures occurred.

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C. Special Monitoring

1. Pajarito Neutrons. On August 2 a spot survey made outside Building 30 during the "Can" experiment in the north kiva gave 34 hours tolerance time per week.

On August 16, a neutron survey was made while both kivas were running at high level simultaneously. Thirteen positions were checked, with five of the areas indicating almost prohibitive tolerance times of as low as 2 1/2 hours per week. The five areas are manned with personnel 100% of the time during working hours. The controlling or limiting factor was found to be due to thermal and intermediate neutrons. For this reason, persons outdoors or in thin-walled buildings receive a high exposure rate under these conditions. Several solution suggestions were given to N-2 for consideration.

2. On July 19, an H-1 representative went to Inyokern, transmitted monitoring procedures to the Inyokern safety man and gave him orientation on the maintenance and use of monitoring instruments for surveying U-238. He also covered the sectioning of two TX-11's to ~~\_\_\_\_\_~~ the ~~\_\_\_\_\_~~ man.

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3. Survey of Source Handling

*Philip Frank*

(Person authorizing change in classification) (Date)

a. The use of a Co<sup>60</sup> source by Doug Venable of G-1 at G1 Site was covered. *Doug Venable 6/1/75*  
(Signature of person making the change, and date)

b. A leaking 145 mg Ra source was checked out for use by H-4 in HRL. The personnel using the source were given information concerning handling times and precautions to take because of the radon generated.

D. Special Work

1. Since the plutonium oxidation incident in P-3, more effort was made to track down all individuals possessing the material in any form in order to advise them of usage precautions, as well as storage.

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2. A paraffin shield was designed and constructed by H-1 for use in storage of mock fission and PoBe sources.

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

<u>A. Accident Record</u>	<u>Jan. 1 to Aug. 1, 1955</u>	<u>1954</u>
Man-hours Worked	3,199,359	5,491,455
Number of Disabling Injuries	9	24
Number of Days Lost	1,033	6,553
Frequency (Accidents per 1,000,000 Man-hours)	2.8	4.4
Severity (Days lost per 1,000,000 Man-hours)	322	1,190

B. Industrial Accident Experience

1. On July 26, [redacted] SP-4, received an eye injury when he hit a nail with a hammer and the nail flew up breaking his personal glasses. A piece of glass cut the cornea of [redacted]'s left eye. It has not been determined at this time whether [redacted] will have any use of his left eye or not.

2. On August 3, [redacted] SD-1, received a fracture of the right radius when his hand became caught on a piece of [redacted] on a lathe - [redacted] is still off [redacted] changed to [redacted] by authority of the U.S.C.R.D.A.

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3. On July 21, [redacted] CMR-AL received a dislocation of the left shoulder while unloading a laundry truck. Lost time was 24 days. (Person authorizing change in classification) (Date)

By Stan Reider 6/5/75  
(Signature of person making the change, and date)

C. Fires

There were no losses from Laboratory fires during this report period.

<u>D. Motor Vehicle Accidents</u>	<u>Jan. 1 to Aug. 1, 1955</u>	<u>1954</u>
Miles Driven	1,022,243	1,667,645
Number of Accidents	22	23
Rate (Accidents per 100,000 Miles)	2.15	1.38
Total Cost	\$3,480.73	\$3,912.56
Accident Cost per 100,000 Miles	\$ 341.00	\$ 235.00

There were two motor vehicle accidents during July; both were backing accidents.

E. General

1. A series of lectures on Laboratory risk was given to members of the

Protective Force.

2. The Group Leader gave a short paper on the problem of test operation safety at a Redwing program meeting sponsored by J-Division.

3. A general review of the safety problems of their future engineering requirements was held with N-Division Groups.

4. Further discussions were carried out with representatives of the Monsanto Corporation on the design and operating ~~of the~~ detonator establishing for Miamisburg, Ohio. Classification changed to **OFFICIAL USE ONLY**

IV. GROUP H-4, BIOMEDICAL RESEARCH, (With the assistance of the U.S. Army, D.A.,  
For Stephen Long (Signature of person making the change, and date)

A. General

John B. Storer, Alternate Group Leader, has returned from Fort Knox, Kentucky, where he has been stationed on active military duty for the past two years.

Several of our personnel have been absent during the past month because of vacations.

B. Biochemistry Section (Gordon Gould, Section Leader)

1. General Remarks on Section Activities

Gordon Gould attended the Second International Conference on Biochemical Problems of Lipids, in Ghent, Belgium, on July 27-30, the Third International Biochemical Congress in Brussels, Belgium, on July 31-August 6, and the International Congress on Radiobiology in Cambridge, England, on August 14-17. He presented papers at the first two meetings, titles and abstracts of which are given under 2. of this Section. He also conferred with Drs. Hellman and Gallagher at the Sloan-Kettering Institute in New York City and with Drs. LeRoy and Wissler in Chicago.

Harry Foreman spent from August 15-22 with Dr. Lowry Dobson of the University of California, Radiation Laboratory, Berkeley, in conference on

americium cases.

A manuscript entitled "The Clinical Significance of Erythrocyte Cholinesterase Titters, Part 1. A Method Suitable for Routine Clinical Use, and the Distribution of Normal Values", by Jean Captain Sabine, has been accepted for publication in BLOOD, THE JOURNAL OF HEMATOLOGY.

An article entitled "Ca EDTA and the Excretion of Pu", by Foreman, Trujillo, Johnson, and Finnegan appeared in Proc. Soc. Exp. Biol. Med. 89, 339 (1955) July.

2. Work Completed

a. Absorption and Metabolism of Dihydrocholesterol and Beta Sitosterol, by R. Gordon Gould, L. V. Lots and E. M. Lilly, based on the talk given by Gordon Gould at the Second International Conference on Biochemical Problems of Lipids, in Ghent, Belgium, was completed and published in a Belgian journal.

Belgian journal.

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Dihydrocholesterol (DEC) and beta sitosterol have long been considered to be essentially unabsorbable. (Person authorizing change in classification) (Date) Current interest in their anti-hypercholesterolemic effects and possible therapeutic uses has suggested the investigation of their absorption, using isotopic tracers.

Tritium-labeled beta sitosterol was found to be absorbed by rats and man as shown by the appearance of T-sterols in blood and tissues. Optimally, the absorption was about 10 per cent as complete as for T-cholesterol under comparable conditions, and was in the range of 1-8 per cent of the dose. It was esterified and distributed in most body tissues in the same manner as cholesterol. Sitosterol does not accumulate in the body, due to a combination of a lower absorption efficiency and a more rapid rate of elimination than for cholesterol.

Absorption of DEC has been demonstrated by comparing total sterol

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content, determined gravimetrically, with cholesterol content, determined colorimetrically, as well as by isotopic methods. Five days of feeding a 1 per cent DEC diet to rats caused a decrease in cholesterol of about 25 per cent in both liver and plasma and no change or a slight increase in total sterol. Feeding  $C^{14}$  - or T-DEC gave similar results; about 20 per cent of liver sterol was replaced by DEC.

b. Equilibration and Turnover of Cholesterol in Liver, Plasma, and Erythrocytes, by R. Gordon Gould, was presented by him at the Third International Biochemical Congress in Brussels, Belgium.

By taking liver and blood from dogs after  $1-C^{14}$ -acetate administration, it has been found that labeled cholesterol appears first in the liver free fraction (peak specific activity value at about 40 minutes); plasma free, (1-2 hours); erythrocyte (3-8 hours); and finally plasma esterified. All specific activity values approach equality.

The appearance of liver free cholesterol molecules in plasma is too rapid to be compatible with turnover half-times of about 6 to 8 days reported for each; it can only be due to a molecular interchange so rapid that the liver and plasma may be considered as a single system, with a single metabolic turnover rate.

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The half equilibration time estimated from the rates at which the specific activity curves approached each other were about 20 minutes for liver free-plasma free, 1.4 hours for plasma free-erythrocyte, and 7 hours for whole blood free-plasma esterified. The rate of movement of free cholesterol between liver and plasma was estimated as about 250 mg per hour in each direction in a dog and 370 mg in man. The possible significance of these observations in regard to lipoprotein structure and cholesterol homeostasis was discussed.



showed poorly separating globulins low in concentration. The sample taken after one week of adequate diet gives a picture within the normal range of concentration and separation of proteins as given by a sample taken from a 9-month normal infant.

d. Acute Toxicity of Triethyl Benzene, Toluene and Solutions of Cadmium Octoate (Sabine, Miller, Campbell, Head).

1) Absorption of Cd from orally administered Cd octoate in toluene. An oral dose of 170 mg Cd octoate (48 mg Cd) was fatal to 3 rats in 3 to 48 hours; 1 rat survived indefinitely. Blood, liver, heart, lungs, and kidney were analyzed for Cd. Approximately 10 per cent of the ingested Cd was recovered. Seventy-five per cent of this was in the liver, 14 per cent in the lung, 6.5 per cent in the heart, and 4.5 per cent in the kidney. The blood contained only a trace. The same volume of toluene alone had no visible ill effects; the animals survived indefinitely.

was fatal within a few days.

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2) Acute oral LD<sub>50</sub> of Cd octoate in triethyl benzene. Four logarithmically spaced doses were given to 4 rats each. The distribution of deaths did not permit calculation of the LD<sub>50</sub> of this material. The distribution of deaths showed that it lies around 30 mgms Cd octoate per kg (8 mg expressed as Cd).

3) Inhalation. It was shown in a preliminary experiment that solid Cd octoate is somewhat volatile. Rats were exposed to "saturated" vapors for 8 hours with no ill effects, and survived indefinitely.

e. Acute Hazard of Tetranitromethane (Sabine, Miller, Campbell, Head).

1) Inhalation. Exposure to a concentration of approximately 1500 p.p.m. prostrated all animals in 15 seconds, and all died in 40 minutes to six hours.

2) Eye. A very small drop (0.01 ml) in the eye of a rabbit

caused immediate irritation, prolonged severe conjunctivitis and blepharitis, and generalized damage to the cornea.

3) Skin irritation. Repeated swabbing of a small area of the skin of a rabbit caused only very mild irritation, and no signs of toxicity from absorption.

A report of these observations was written on Aug. 3, and distributed to H-DO, H-4 and H-5 offices, and to the Group Leaders of GMX-2, GMX-3, and GMX-8.

4) Inhalation. Eight hours exposure to 0.3 p.p.m. TDM caused no visible ill effects and the animal was healthy.   
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Per Philip Henry  
By Gene Schner 8/1/78  
(Signature of person making the change, and date)

f. Clinical Studies on Cholinesterase (Sabine, Miller).

1) Acute leukemia. This is the case in which clinical and hematological remission occurred in the winter and spring of this year, with partial relapses during the summer. During July and August, the hematocrit has fallen and there has been no increase in cholinesterase titer (CHE) of the red cells; in early August, there was a sharp fall in titer. The failure of a rise was regarded as unfavorable, and the fall as extremely unfavorable. The patient has had two transfusions, the benefit of which has not been well sustained, and his clinical condition has deteriorated.

2) Severe nutritional anemia. The patient is a boy of one year who looks like a very pale, weak baby of about 7 months. On an adequate diet supplemented by oral iron, clinical improvement was visible very promptly, the hemoglobin rose from 4 to 9 grams in two weeks, the hematologic picture in general improved greatly. The red cell CHE titer rose from a very low value, 0.56, to a midnormal value, 0.98. In this case the CHE titers did not add to the understanding of the condition, but findings confirm the belief that CHE

titers reflect the condition of the bone marrow. The plasma cholinesterase rose from 0.63 to 0.85, as is to be expected with improved general nutritional status.

3) Miscellaneous. Normal CHE titers have been found in the following conditions, all without anemia, infectious mononucleosis (2 cases); carcinoma without evidence of metastasis (3 cases); and in one case of anemia secondary to carcinoma with known pulmonary metastases. In the last case, the finding of a normal CHE titer indicates that the anemia is attributable to suppression of bone marrow function.

g. Variation in Urinary Plutonium Excretion (Foreman, Moss).

With the availability of a suitable subject, i.e., one excreting readily measurable levels of Pu in the urine, a study was carried out in which the variation of Pu excretion from day to day and within the day was studied. All urine voided for one week was collected in three sampling periods per day, namely, from 8 a.m. to 5 p.m., from 5 p.m. to bedtime, and from bedtime to 8 a.m. At the end of each sampling period, the bladder was emptied and the contents added to that already collected. U. S. E. R. D. A.,  
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The results varied from 0.5 to 12.3 d/m/24 hrs with no readily apparent pattern of variation. From inspection (not from statistical analysis) there was no significant difference between sample periods within the day. (Signature of person making the change, and date)

h. Follow-Up on Polonium Exposures (Foreman, Eutsler). On Aug. 3, a large group of P-Division and H-1 personnel were exposed to polonium by inhalation and skin contact as a result of an explosion of a neutron source. Urine assays were done on all individuals actually or potentially exposed. Only four persons showed concentrations in the urine of over 1000 d/m/1 by 24 hours after the accident, and of these, two had levels over 2500 d/m/24 hrs. Complete blood counts were done within 18 hours of the accident and 10 days later.

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There was no change in any of the individuals. More intensive follow-ups were carried out in the highest level cases, namely, blood assays at 18 hours and urine and feces assays for three full days after the accident and then at weekly intervals. Two weeks after the accident, one of the individuals excreted 1950 d/m/24 hrs and the other 920 d/m/24 hrs.

C. Radiobiology Section (Payne S. Harris, Leader)

1. Work in Progress

a. Determination of an RBE with the Use of AK Mouse Leukemia in Various Strains of Mice (Boone, Strang, Stedman, Rogers). Using the system of AK leukemic takes as the endpoint, the RBE of X rays and thermal neutrons has been completed in three strains of mice, namely, the C57 Brown, Strong A, and C57 Black. The RBE values to date range from 1.06 in the A strain, to 1.7 in the C57 Brown. The data are being prepared for publication.

b. A Study of the Passage and Adaptation of AK Mouse Leukemia into the Swiss-Strain of Mice Before and After Exposure to X rays (Stedman, Boone, Strang). As has been previously reported, studies on the chronic type of leukemia produced in the Swiss mice with AK leukemia is being thoroughly investigated. Peripheral blood counts and pathological tissue sections at various intervals after transplantation of AK leukemia into radiated and non-radiated CFW Swiss strain of mice have been obtained. The peripheral blood count data are being evaluated and the pathological sections are under study.

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Per Philip Strang  
Continuous periodic blood counts and pathological sections through the CFW strain are planned. By Jean Fisher 6/15/78  
(Signature of person making the change, and date)

c. Protective Effect of Bone Marrow Shielding during X Irradiation Against AK Leukemia in the Swiss and C57 Black Strains of Mice (Stedman, Boone). A previous Progress Report mentioned that shielding the femoral bone marrow of female Swiss mice during radiation doses of 100, 300, and 500 r of X rays did not protect them from increased susceptibility to AK mouse leukemia.



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inorganic compounds, in bacteria, and in biological tissues, has been completed. Van Slyke wet oxidation followed by BaCO<sub>3</sub> direct plate counting was a comparative method used with C<sup>14</sup>-materials.

The coincidence counter has been altered to use a new shield designed by John Larkins. It has the excellent feature of being light-tight in the sample changing position, as well as in the sample counting position. This allows the high voltage to be left on continuously, contributing to counting stability in this method where the sample is changed between individual one-minute counts.

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The 100-ml counting bottle has now been successfully replaced by an inexpensive commercial plastic-stoppered clear glass vial with an effective capacity of about 25 ml. This is both economical and more efficient where colored suspensions are used. The shorter light-path cuts down on light absorption, allowing greater pulse height.

*Philip Berg*  
(Person making change in classification) (Date)  
*6/5/78*  
Signature of person making the change

A manuscript concerned with suspension counting is being prepared for journal publication.

g. Metabolism of Gamma Emitters - Alkaline Metals (Woodward, Rothermel). Sodium<sup>22</sup> turnover after intraperitoneal administration has been followed in mice and rats. Whole body counts and the counts in excreta were obtained in the 'arm counter'. The mice have a turnover time of about 41 hours; whereas, the rat is 102 hours on standard laboratory diet. (Sodium content 17.4 meq/100 gm).

After the mice had been followed 3 half-lives, there was deviation from the simple exponential. This has not shown up in rats after approximately 4 half-lives. These animals will be followed on low sodium and high sodium diets. In conjunction with this work, all standard animal diets used for mice, rats, dogs, and monkeys were analyzed by W. J. Eversole for Na and K content.

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h. Effects of Irradiation on Gastrointestinal Tract (Woodward, Rothermel). Complete medullectomy (20 days post-operatively) did not appear to affect the degree of gastric retention seen in rats for 3-4 days after irradiation. Complete adrenalectomy (3 days post-operatively) seemed to alter the time of onset of gastric retention considerably. The irradiated adrenalectomized rats showed relatively normal gastric emptying for several hours, but thereafter retention was marked for 3-4 days as in normal irradiated rats. Sham operated (3 days post-operatively) rats also exhibited normal emptying and late retention.

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This work is in readiness for manuscript.

(Person authorized to change in classification) (Date)

1. Weight Loss and Survival After Thermal Column and X-ray  
By Max Furchner 6/5/78

Exposures (Woodward, Rothermel). Weight loss in the rats 72 hours post-irradiation proves to be a reasonable biological indicator of dose for 50 to 1200 r or rem of thermal column irradiation. At 1200 r, weight loss is comparable to that of an unirradiated starved and thirsted animal. No further weight loss occurs regardless of dose.

Furchner had noted that in mice maximum weight loss did not occur until after 10,000 r. Mice were, therefore, exposed to 665 r to 10,000 r and 450 to 10,000 rem of thermal column irradiation. The probit of per cent starvation weight loss proved to be linear with log dose up to 10,000 r and 10,000 rem of thermal column radiation, where 100 per cent of starvation weight loss occurs.

The mice were observed also for median survival times and 30-day lethality.

The turnover of induced activity from thermal column irradiation was followed in 4 groups of mice for 52 hours post-exposure. The excreted material had a half-life of 14 hours. The 450 rem group showed a turnover of

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37 hours for induced activity. The supralethal groups, 1000, 2500, and 5000 rem, showed prolonged turnover times.

j. Chemical Dosimetry (Schweitzer). This month was spent primarily in becoming familiarized with the problems of chemical dosimetry. Many runs with the 1-phase trichloroethylene system were made, and also with different shielding devices with Co<sup>60</sup> radiations, as well as with 250 KVP X rays. The results seem to be falling in such a pattern as to expect much improvement in the near future in the progress of this project.

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D. Radiopathology Section (C. C. Lushbaugh, Leader)

1. Work Completed

(Person authorizing change in classification) (Date)

By Philip H. King 6/5/58

First drafts of two papers entitled: "The Relative Biological Effectiveness

Effectiveness of X rays and Beta Rays Using the Broad Bean Root (Vicia faba) as a Test System", and "The Effects of Rapid Massive Doses of Gamma Rays on the Testes and Germ Cells of the Rat", by John F. Spalding, have been submitted.

Final drafts of two papers entitled "The Effects of Lethal Doses of X Rays on the Maturation of the Rat Ovum and Its Modification by Gonadotropins" and "A Chromosome Study of the Wild Pig (Pecari angulatus) and the Domestic Pig (Sus scrofa)", by John F. Spalding, have been submitted.

A paper entitled "The Maturation Process of the Ovum of Swine During Normal and Induced Ovulations", by John F. Spalding, was published in the August issue of The Journal of Animal Science.

2. Work in Progress

a. Cytologic Study of the Effect of Radiation upon Mitotic Processes (Hale, Lushbaugh). Much of the month was spent in analyzing and comparing the data from the various completed experiments. A review was made of the work completed to date and the various incompletd experiments were either completed or discarded. The material for two additional experiments was obtained

using trypsin to cause an in vitro destruction of the mitotic processes.

b. Serum Enzyme Inhibitor Systems (Hughes, Lushbaugh). The effect of trypsin upon the process of gelation was studied. It was found that using a crude system employing the gelation of gelation that minute amounts of trypsin caused extensive prolongation of the gelation time. In an attempt to make these observations more accurate, the changes in the viscosity of the gelation solutions were studied using a viscometer under various conditions. This work is incomplete.

~~OFFICIAL USE ONLY~~

Classification changed to  
by authority of the U.S.E.R.D.A.,

c. Effects of Various Kinds of Radiation on Bean Root Growth (Spalding). An apparatus has been designed and completed for exposing bean roots to alpha rays from radon gas. (Person authorizing change in classification) (Date)  
By John Spalding 6/15/78  
(Signature of person making the change, and date)

d. Studies upon the Effect of Beta Rays upon the Skin (Beddo, Lushbaugh). I. Comparison of the Effectiveness of Beta Rays in Injuring the Skin as Modified by Mev Strength of the Particles (In conjunction with Payne Harris and Wright Langham). In addition to the study being made of Sr<sup>90</sup> and Au<sup>198</sup>, the effect of Pd<sup>109</sup> was studied under similar conditions on the rabbit skin. It was found that at 20,000 rep, Pd<sup>109</sup> caused burns which were comparatively superficial and of mild degree. This work is being extended by further gross observations and biopsies of the lesions for histopathologic study.

II. Locally applied proteolytic enzymes were found to exert a seemingly beneficial effect upon beta irradiated skin. The actual extent of therapeutic effectiveness is being evaluated. It was found that the enzymes worked better in a Carbowax (lubrication jelly) medium than they did in easily evaporated aqueous solutions.

e. The Use of Light-Emitting Bacteria in the Study of Relative Biological Effectiveness and Mode of Action of Radiation Damage (Hughes, Beddo,

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Lushbaugh). Various natural and synthetic media were studied in order to determine whether or not the prolonged lag phase of growth could be overcome. So far, these studies have been unsuccessful.

f. Radioautographic Studies of Biological Materials Containing Boron (Wellnitz, Langham). The project looks insufficiently promising and further studies have been cancelled.

g. Study of New Mechanism of Protection Against Radiation Damage (Spalding, Sanders). Preliminary problems on a study to determine the protective effect on the mother of shielding in utero embryos during X-ray exposures above the LD<sub>50</sub> range are being worked out.

h. Histopathological Service (Wellnitz, Smith, Lushbaugh). The pathology of EDTA (Foreman) and pathology of dermal radiation wounds in sheep (Lushbaugh) were completed.

Extensive histopathological preparations are being done for:

- 1) the transplanted leukemia (Stedman);
- 2) enzymatic debrided beta

Lushbaugh);

3) comparative pathology of heavily irradiated human cancer tissues (Lushbaugh, Hale);

4) the cytology of enzymatic action (Hale); and

- 5) pathology of routine hospital services.

E. Biophysics Section (Ernest C. Anderson, Leader)

1. General Remarks on Section Activities

E. C. Anderson made an official trip to consult with Dr. N. T. Mirov of the U. S. Department of Agriculture Forest Service at Berkeley on samples for contemporary C<sup>14</sup> measurements. Dr. Mirov has an extensive collection of

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turpentines from the genus Pinus from all over the world with known localities and dates of collection; four samples were brought back for preliminary study, including one from Formosa, 1953, that will be interesting to compare with the Formosan camphor samples.

2. Work in Progress

a. Human Counter (Anderson, Ferrings). The self-absorption of a 60 lb sugar phantom for K-40 was measured. KCl alone had a 10 per cent efficiency, KCl in the phantom, 8.7 per cent or 23 per cent self-absorption loss. The sensitivity of the detector was measured along the length and found to be down to 67 per cent of the middle value at a distance of one foot from either end. This is more than that calculated on the basis of counter geometry and may result in part from the narrow energy gate used.

The background entering the detector through the open end was studied by hanging 1/8-inch sheets of lead over the opening to a total thickness of 3/4 inch. The apparent absorption coefficient indicated an energy of about 1 mev. The intensity seemed to be about 50 per cent of the total background. It seems desirable, therefore, to have some sort of absorption of 2 inch Pb to close this end of the shield.

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by authority of the U. S. E. R. D. A., \_\_\_\_\_

The detector has been shut down for the purpose of rewiring the photomultiplier tubes.

(Person authorizing change in classification) (Date)  
*Philip Ferrings*  
By *Jean Ferrings* 6/15/78

b. Natural Radiocarbon Measurements (Anderson). In addition to

the samples obtained from Dr. Mirov (see General Remarks above), eight samples of gum turpentine from southeastern United States have been received from E. L. Patton of the Naval Stores Stations, Olustee, Florida.

c. Neutron Dosimetry (Sayeg, J. Larkins). Construction of new chambers is in progress.

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d. X-ray Exposures (Worman, L. Larkins). A number of exposures were made on rats and mice during the past month using the Maxitron. In addition, considerable time was spent in the exposure of the halogenated hydrocarbon dosimeters prepared by Schweitzer. Total time to date on the Maxitron is 371 hours with 4232 exposures.

e. Study of Beam Collimation for Maxitron (Worman, L. Larkins). A study of beam collimation to determine the diameter of the beam at all distances was made and graphed for the Maxitron using the beryllium window tube.

f. Radiographs on Monkeys Following Ingestion of Barium (Worman, L. Larkins). A technique was worked out using the Picker Field Unit for taking spot film gastro-intestinal radiographs on monkeys following ingestion of barium. This may be used to record observations made during fluoroscopic examinations.

g. Card Filing Systems (Worman, L. Larkins). A card file listing medical and experimental records of all the monkeys has been prepared. The same has been done for the dog colony, including a genealogical record of all dogs born here. All dogs have been tattooed for positive identification.

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By authority of the U. S. E. R. D. Act

F. Organic Chemistry Section (Wright Langham, Leader) *Philip Lang*

(Person authorizing change in classification) (Date)

1. Work Completed

By *Jean Lehner* 6/15/78

a. The manuscript "Liquid Scintillation Counting of Gases by Weight Comparisons of Primary Solutes", by F. Newton Hayes, Donald G. Ott, and Betty S. Rogers, has been completed and submitted for publication in Nucleonics.

b. Preparation of 3-Methyl-2-butenic-1-C<sup>14</sup> Acid (Williams). The infrared absorption spectra of the pure sodium salts of 3-methyl-3-butenic acid and 3-methyl-2-butenic acid indicated that the former is completely isomerized to the latter by treatment with 25 per cent potassium hydroxide at 100° for 1 hour. The effect of temperature on the yield of the intermediate acid during carbonation of the Grignard reagent was also studied. At -60° the

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yield of acid was practically quantitative ( $\sim 94$  per cent).

A 5-mc. (1.1 mmole) quantity of 3-methyl-2-butenic-1-C<sup>14</sup> acid was prepared in 95 per cent yield. The product was isolated by steam distillation and delivered as an aqueous solution of the sodium salt.

## 2. Work in Progress

a. Synthesis of Organic Scintillators (Kerr). Several intermediates for oxazole formation have been synthesized. Two new oxazoles have been made, namely, 2,5-di-[2-(5-phenyloxazolyl)]-pyridine (POYOP) and another pyridyl oxazole whose structure is in doubt. POYOP fluoresces at approximately the same wavelength as POPOP and is considerably more soluble.

b. Oxazole Quaternary Salts (Ott). The three, isomeric 2-(pyridyl)-5-phenyl-oxazoles form quaternary pyridinium, rather than oxazolium, tosylates; the proof of structure was made from ultraviolet absorption spectra (Beckman DK-1), and supported by chemical evidence. These compounds exhibit the thermoregulatory effect. An oxazolium structure was previously considered necessary for this type of action. The value of quaternization now seems to lie in its solubilizing effect; this theory is being tested with the hydrochloride salts of the pyridyloxazoles.

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by authority of the U. S. E. R. D. A.,

A rough draft of a paper for submission to the Journal of the American Chemical Society is practically completed which reports the synthesis of 26 new oxazole salts, several new oxazoles and reaction products of oxazolium salt hydrolysis, and the infrared and ultraviolet absorption spectra of these compounds.

## c. Spectroscopy of Organic Scintillators (Ott, Hayes, Kerr, Benz).

Scintillation spectra have been obtained of a number of representative scintillator solutions. The source was 100 mc of Cs<sup>137</sup> (previously described) and exposure time for each plate was 20 hours. Secondary-solute systems chosen for

study with 4 g/l terphenyl as primary solute were POPOP at 0.1, 0.03, 0.01, 0.003, 0.001, and 0.0003 g/l; BBO,  $\alpha$ NPO, diphenylhexatriene, 2-(4-biphenyl)-indole; and  $\beta$ -NOON, each at 0.1 g/l. POPOP at 0.1 g/l was run also with PPO as primary solute. Single-solute systems studied were PPO,  $\phi_3$ , BPO, PBD, PPD, and TTD.

Densitometer tracings of these spectra were corrected for spectograph dispersion, emulsion sensitivity, and photon energy to give spectra in terms of relative number of photons versus wavelength. From such curves were obtained "mean wavelengths", the wavelength which divides the curve into two equal areas; these mean wavelengths are thought to be a more meaningful property than the wavelength of maximum emission. The spectra were further converted to yield curves of relative number of photoelectrons produced for S-9 photomultiplier response versus wavelength. The relative areas of these latter curves should be proportional to the respective relative pulse heights. The results have not been thoroughly compared as yet; however, this relation appears to hold (in spite of all the correction and conversion factors). Interesting effects of incomplete energy-transfer in the more dilute POPOP solutions have been noticed.

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Since the corrected areas of fluorescence spectra from "top surface" ultraviolet excitation bore no relationship to relative pulse heights, a method of "front-face" illumination was devised. These methods have been used by other investigators to study energy transfer, and the results assumed applicable to the scintillation process. Our results show this is not the case, either for relative intensities or for position and number of emission maxima. Selected data are being assembled for a publication on this point.

The ultraviolet absorption spectra have been obtained (Beckman Model DK-1) for approximately 75 more scintillation solutes.



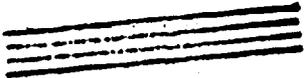
d. Liquid Scintillators. II. Relative Pulse Height Comparisons of Secondary Solutes, by F. Newton Hayes, Donald G. Ott, and Betty S. Rogers, is now being put into manuscript form for publication in Nucleonics.

e. Labeling of N,N',N''-Triethylenethiophosphoramidate with C<sup>14</sup> and Tritium (Williams). Since procedures for preparing the essential intermediates and ethanolamine-C<sup>14</sup>, starting with barium carbonate-C<sup>14</sup>, have been described, the preparation of T-aminoethyl hydrogen sulfide, ethylamine and TEPA are being investigated on a millimole scale. ~~OFFICIAL USE ONLY~~  
 Classification changed to ~~SECRET~~ by ~~AGILE~~ of the U. S. S. R. D. A.

f. Labeling of 3-Hydroxybutyric Acid (Williams). The preparation of C<sup>14</sup>-labeled 3-hydroxybutyric acid (or any  $\beta$ -hydroxy acid) in high yield appears somewhat doubtful because of ~~(1) the low yield of the Grignard reaction of a  $\beta$ -hydroxy-nitrile is accompanied by considerable dehydration, and 2) the use of the Grignard reaction is excluded even with the hydroxyl group protected by an acetal type block, because the intermediate alkylmagnesium halide is unstable and decomposes to give propene. However, the trityl ether of 2-hydroxybromopropane is stable in basic medium but is easily cleaved by hydrogenolysis. Two routes of investigation using this intermediate are proposed: 1) preparation of the corresponding nitrile followed by hydrolysis and hydrogenolysis, and 2) reaction of the intermediate directly with lithium metal followed by carbonation and hydrolysis. Either of these schemes, if successful, would afford a good general route to  $\beta$ -hydroxy acids.~~  
 (1) Grignard reaction, change in classification, (2) low yield  
 By ~~AGILE~~ ~~SECRET~~

The necessary trityl ether intermediate is being prepared.

g. Preparation of C<sup>14</sup>-Labeled Compound No. 738 (Murray). In preliminary studies, both of the possible intermediates and the final product have been prepared. Further work will be done on developing the synthesis on a millimole scale.



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V. GROUP H-5, INDUSTRIAL HYGIENE (H. F. Schulte, Leader)

A. Beryllium

Significant advances have been made during this period on studies of the solubility of beryllium compounds in biological fluids. Modifications made on the Los Alamos fluorimeter have resulted in measurements considerably more reliable than those obtained previously.

The Beryllium Shop has operated for ten days during this period and a total of 40 air samples collected were all below tolerance.

B. Uranium

In co-operation with Group H-1, a study was made during the extrusion of tuballoy into welding rods. Of the 41 air samples collected during the entire operation, 32 samples were above tolerance; respirators were worn by all workmen.

A study was made with Group H-1 of the floor contamination problem at T Shop. Recommendations have been made to control the spread of contamination primarily by a controlled traffic pattern. The air sampling study in T Shop has been terminated and a report covering contamination of the ventilation system is being prepared. ~~OFFICIAL USE ONLY~~

Classification changed to  
by authority of the U. S. E. R. D. A.,

C. TNT

Per Philip Tang  
(Person authorizing change in classification) (Date)

A total of 23 air samples for TNT has been collected during this period. By Philip Tang 6/15/78  
(Signature of person making the classification)

These samples represent exposures from casting, machining, sawing, chasteinjection.

With the exception of one sample collected during the operation of a power saw, all samples showed concentrations to be well below the permissible level for TNT.

D. Tetranitromethane

The preliminary toxicity study has been completed and conferences were held with Kappa Site personnel regarding the hazards involved with tetranitromethane. All preparations and precautions have been taken for the TNT shot scheduled for August 31. The co-operation of Kappa Site personnel on this

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study is to be commended.

E. Plutonium

New stack sampling equipment has been designed, fabricated, and installed at the DP West filter house. The only job that remains to be done before sampling can be initiated at these new locations is for the Zia Company to connect the blowers to the sampling tubes. The new stack sampling locations designed to collect representative samples under the existing conditions will be run in conjunction with the Filter Queen which has been in continuous service.

A continuous sampler counter that was contaminated at DP West has been decontaminated, reassembled and recalibrated and is presently in use at DP West. It is anticipated that an additional model may be available in 12 to 18 months.

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Classification changed to CONFIDENTIAL  
by authority of Philip Tang, U. S. E. R. D. A.

Several conferences have been held with OR and H-1 personnel relative to the control of potential hazards during the pressing of plutonium on the 5000 ton press at the TA-3 Press Building. Final arrangements for this operation have been made and it will be done in the near future.

During this period there was a large increase in the number of plutonium urinalyses. In addition, work is being done on the diurnal variation in plutonium excretion. To date, there seems to be no significant difference in samples collected during the day or following the night.

F. Polonium

An accident which caused the rupture of a polonium source created a major contamination problem in the Physics Building. There were approximately 150 P-Division employees that were potentially exposed which required repeated urinalyses. In addition, polonium urinalysis was carried out on all janitors involved in P-Division, as well as H-1 personnel. Follow-up urinalyses are being continued on several persons who received significant exposures. The

magnitude of this exposure made it necessary to set up additional equipment in the Laboratory Section in order to keep up with the great number of polonium analyses required.

G. Ventilation

Group H-5 conferred with ENG-2 regarding the design requirements for the ventilation of the storage tunnel at W Site. A conference was also held with SD-2 regarding the anticipated move of the Pattern Shop from TA-1 to the new Shop Building at TA-3.

Recommendations were made for the ventilation to be used for plastic molding in the TA-3 Press Building. A study has been completed and a memorandum written to ENG-1 regarding the H-Division requirements for stainless steel duct work rather than coated mild steel ducts in the new Radiochemistry Building. Additional conferences have been held with CMR-7 regarding the detailed design of hoods in the new Sigma Building. Additional work was done on the ventilation study at DP West.

H. Plans Approved

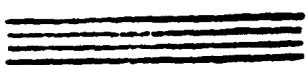
1. Inspection line modifications, GMX-3.
2. Ventilation of a plastic furnace, CMR-6.
3. Salt pot and swager exhaust, CMR-6.
4. Nemo process ventilation in Building 21, TA-3.
5. Ventilation of Cincinnati shear, CMR-6.

I. Miscellaneous

During this period the Shops Department cleaned the perfluoropolyether degreaser. Group H-5 set up and provided supplied airline regulator for workmen entering the tank.

Recommendations have been made regarding safe methods of machining and grinding tantalum, zirconium, columbium, titanium, and tungsten carbides combined with uranium.

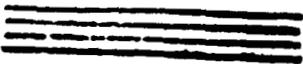
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The Laboratory and Field Sections worked together to set up an ozone generator in series with the apparatus to produce varying concentrations of ozone in order to test the new analytical methods developed by the Laboratory Section. The sensitivity of the ozone method under investigation is better than originally assumed; this study is being continued.

The installation in the Cyanogen Experimental Building at TA-9 is being followed very closely to insure complete protection for the personnel involved. In conjunction with this work, a method for the determination of cyanogen in air by direct color comparison has been developed. The Laboratory Section will complete the final evaluation in the near future.

The exposures arising from the machining of a formalic resin is now under control. The operators experienced irritation to the eyes and nose during the machining of this plastic shape without a water coolant. At present, the water coolant is being used to control the irritating fumes given off during this operation. Other locations such as the S Site Shop are using full face masks during dry machining. If this compound is used extensively, adequate local exhaust or other control measures will be installed.

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literature on the toxicity of this material is being considered.

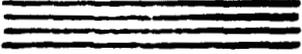
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During the processing of plastic materials at TA-9 involving ethyl acetate as a solvent, nuisance odors are given off. Two air samples collected for ethyl acetate during this process were below 150 p.p.m.

*Philip Tang*  
 (Person authorizing change in classification) (Date)  
*Philip Tang* 6/15/58  
 (Signature of person making the change, and date)

A check was made at the Van de Graaff Building for mercury vapors. An additional check was made following a mercury spill in Building 32 at TA-9. In both locations, the concentrations for mercury vapor were well below tolerance.

The Field Section has started fabrication on six new portable air samplers of the type called "giraffes". All sampling pumps and rotometers have been serviced and recalibrated during the summer months.



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Dr. Charles R. Williams, consultant to the Health Division, spent one week with the Group during this report period. Of particular advantage to the Group was Dr. Williams's review of new methods and comments on surveys completed during the past year.

An industrial hygienist from the Dow Chemical Company at Rocky Flats completed a six-weeks training period in industrial hygiene techniques.

J. Statistical Summary

1. Air samples collected or field tests made for:

Beryllium	40
Chromic acid mist	4
Ethyl acetate	2
Mercury (labs)	2
Perchloroethylene	6
TNT	23
Uranium	41

2. Plans approved 5

3. Sanitation  
Water samples collected 22

4. Analyses completed  
Air  
Beryllium 34  
TNT 23

Biological (urine)  
Americium 58  
Plutonium 302  
Polonium 734  
Tritium 205  
Uranium (fluorimetric) 43

Miscellaneous  
Plutonium in tissue 7  
Uranium in oil 1  
Uranium in soil or water (fluor.) 78  
Uranium in tissue (fluorimetric) 1

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Per *[Signature]*  
(Person authorized to change classification) (Date)  
By *[Signature]*  
(Signature of person making the change, and date)

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VI. GROUP H-6, RADIOLOGICAL PHYSICS (T. N. White, Leader)

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A. Special Problems Section

Classification changed to  
by authority of the U. S. S. R. D. A.,

1. General

Per Richard Lang  
(Person authorizing change in classification) (Date)  
E. Storm is on vacation from Aug. 2 until September.

2. Work in Progress

By Manuel Thomas 6/5/58  
(Signature of person making the change, and date)

a. The first draft of a LAMS report on the high intensity arc work to date has been written and is being edited and reworked.

b. Because the tissues such as lung, liver and kidney of the mouse generally have a higher specific activity of thoron daughters than does the blood when the animal inhales an atmosphere containing thoron, the problem is being further investigated by using other means of introducing the activity into the animal.

1) Feeding the animal thorium B activity in its food shows that only a fraction of one per cent of the activity is absorbed from the G.I. tract.

2) Injecting solutions of thorium B into the peritoneum or veins gives lung, liver, and kidney about twice the specific activity of that of the blood. It is now planned to fractionate the blood into serum and erythrocytes and study the specific activity of the two parts when the activity is introduced as thorium B (lead) by injection and when the activity is introduced by inhalation and solution of thoron and its subsequent decay in situ.

3) It has been observed in inhalation experiments of long duration that the lungs show gross pathologic changes. It is assumed this is the result of nitric acid fumes which arise from the boiling of the thorium nitrate solution. It is planned to introduce an acid absorber preceding the exposure chamber.

c. A sealed modification of the portable P-1 integron is being

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designed so that it will be usable in overseas tests. It is planned for P-1 to make ten units.

3. Work Completed

- a. The revised manuscript of the paper describing a film badge method of evaluating thermal neutrons and gamma ray exposures has been accepted for publication in Nucleonics. The same work in more complete form has been published as LA-1923.
- b. The manuscript of the Teapot report (gamma ray versus distance) has been finished and is being reviewed. It is intended that it be submitted to Ehrlich of NBS because of her interest in our thimble chamber results.
- c. The three Model 120 Balanced Air Samplers have been completed and subjected to gamma ray calibration. We are now awaiting their calibration with tritium by H-5 before turning them over to the report describing them.

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B. Meteorology Section (Maj. O. W. C. Stephens) (Change in Classification) (Date)

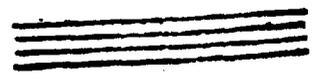
1. General

Per Philip Kang  
By Alan Hansen 6-5-51  
(Signature of person making the change, and date)

- a. Approval has been granted from Headquarters, 4th Weather Group for indoctrination of a forecaster from Detachment 23, 4th Weather Group, Kirtland AF Base. This forecaster would be utilized for emergency assistance during periods when the forecaster strength of this section is seriously curtailed.
- b. A request was forwarded to 4th Weather Group for assistance from the Nellis AF Base (Las Vegas, Nevada) for small scale tests at NTS. The 4th Weather Group has approved the plan, and the correspondence has been forwarded to the 8th Weather Group for final approval.

2. Operations

- a. J-DO was provided with a climatology study for October-November



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operations at NTS.

b. Personnel of W-3 were advised relative to the proper location of wind and other weather equipment at a site at TA 33.

c. Supply personnel of Kirtland were consulted relative to the changes in supply accountability of Air Force equipment.

d. Preliminary work has continued on the problem of forecasting maximum cloud heights.

1) A request has been forwarded to IBM for a 701 machine code capable of handling correlations of as many as eight independent variables, to be used in a statistical approach to the problem.

2) Personnel of CMR-9 were consulted relative to the energy relationships in moist atmosphere. by authority of the U. S. E. R. D. A.,

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C. Nuclear Field Test Section (William R. Kennedy, Leader) *Philip Long*  
(Person authorizing change in classification) (Date)

1. General

By *Gene Helmer 6/15/58*  
(Signature of person making the change, and date)

a. Fall-out

It was reported on June 3 that blue snow had fallen in the vicinity of Eagle's Nest, New Mexico on May 17-18, and that cattle were suffering with inflamed udders and children were complaining of reddened faces and swollen tongues. Within the next 60 days several cattle died of unknown causes while pasturing in a remote meadow in this area. Samples of cow droppings were collected from this meadow after these deaths and were delivered to AEC LAFO Health and Safety Office on July 19. At the request of AEC SFOO, assays were run on the cow manure for gross alpha, beta and gamma activities. Gross alpha results were insignificant. However, gross beta and gross gamma activities were found to the extent of approximately 250 counter counts per minute per gram of dried material. Pulse height analysis and preliminary decay study of the gamma activity indicate fission product activity. From the date of snowfall

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we assume the activity is from the Zucchini shot of Teapot.

As a consequence of finding this order of magnitude of activity in these manure samples, a program of assaying manure from the Los Alamos region was started and is continuing. All samples assayed to date have had activity. Samples from areas other than the Eagle's Nest region had activities up to approximately one-third that found in the first samples. Further investigation of the pastures in the Eagle's Nest region will

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b. Redwing

Classification changed to \_\_\_\_\_  
by authority of Lao U. S. E. R. D. A.

Section members attended the Project Officers meetings for  
(Person authorizing change in classification) (Date)

TG 7.1.

By Lian Lehner 6/5/78

(Signature of person making the change, and date)

Considerable time and effort have gone into setting up

instrumentation recommendations for TU-7.

c. A continuing program of air sampling and rain water assaying for gross activity is on operation.

d. Considerable planning and discussion was done on the one point detonation program.

e. Coding clean up and additional subroutine coding has been done for the 701 on the fall-out problem.

2. Laboratory Activities (A. O. Dodd, B. F. Schnap)

a. Approximately 230,000 gallons of chemical waste from CMR Building were sampled and assayed for alpha activity. All batches were released to the Waste Treatment Plant.

b. Samples of drinking water and circulating water from CMR Building and DP West Site were assayed for alpha activity. No activity was detected in the drinking water. The circulating water in CMR Building assayed no activity. Traces of activity were found in circulating water systems at DP West with histories of contamination. A build-up of activity has occurred in a system with a contamination history through the use of a water treating compound.

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The system is due to be replaced in the near future.

c. During the month the following samples were collected and assayed:

Sixteen soil samples collected in the area surrounding the Physics Building following the incident of Aug. 3 were assayed for polonium. All results were negative. The samples were also assayed for gross beta, gamma activity. Results were negative.

Twenty-one samples of rain water including 6 run-off samples taken during the first rain after the Aug. 3 incident were assayed for polonium, gross alpha activity, and gross beta activity. Results were negative.

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by authority of the U. S. E. & D. A.,

Twenty-three cow manure samples were assayed for gross alpha, beta, gamma activity, and uranium content. The results are reported in Section 1. a

(Person authorizing change in classification) (Date)  
*Philip King* 6/15/78  
\_\_\_\_\_  
(Signature of person making the change, and date)

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

A. Plant Operation

1. TA-45, Tech Area. The volume of waste from TA-3 has increased markedly during the past week. Steps are being taken to eliminate unnecessary water usage in order to avoid operation over the week end.

Some difficulty was anticipated as a result of a polonium spill in the Physics Building. Polonium content of the raw waste increased to about 1860 c/m/l but effluent count was kept under 35 c/m/l without special treatment or recirculation.

Operation at the Tech plant was otherwise routine.

2. TA-21, DP West. About 1300 gallons of a waste containing large amounts of sodium citrate were treated. This leaves the large storage tank near the building available for storage of special wastes.

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laboratory tests with new resins show about the same results indicating that faulty regeneration is not the cause of the poor performance.

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B. Research and Development

Classification changed to  
by authority of the U. S. E. R. D. A.,

1. Plant Operation

Per Philip Lang  
(Person authorizing change in classification) (Date)

a. TA-21, DP West.

Some 17,000 gallons of waste containing about

10% iodine, 500,000 c/m/l Pu and 1 N KNO<sub>3</sub> (nitric acid) (Date)  
general tank area near DP East. These wastes have been stored for several years and the drums are gradually disintegrating so it becomes necessary to get the wastes in some form for final disposal in order to prevent serious contamination in the tank storage area. Since this amount of waste represents about 6 tons of iodine, disposal becomes quite a problem.

Dilution with wastes at the TA-21 plant would be easiest and most desirable but since the flow is only about 8000 gallons per day this would require a considerable length of time. Dilution at TA-45 with 35,000 GPD would be faster but requires transportation of the waste across town. Treatment with copper sulfate to precipitate cuprous iodide and iodine is apparently effective in varying dilutions but presents a corrosion problem as well as posing the problem of whether or not it is wise to bury 6 tons of iodine in the ground in any form. Recovery of this amount of iodine may be feasible but it is improbable that it could be produced free from plutonium contamination. The possibility of pouring concrete with the waste as the liquid shows some promise but will be expensive. Transportation of the waste to the Pacific Ocean is a possibility but may prove to be too expensive. All of these possibilities are being investigated at some length to determine the most feasible means of disposal of these wastes.

b. TA-45, Tech Area. A series of tests is being run on the use of a newly developed coagulant aid, "Separan". Preliminary tests show it to

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have considerable promise as an aid in formation of a more compact and rapidly settling floc in the treatment of our wastes. This may increase the treatment rate in this and the TA-21 plant. Of equal importance is the apparent increase in sludge filtration rate which is one of the present bottlenecks in plant operation. Laboratory tests will be continued on this product.

c. TA-35. At the time the Ten Site plant was designed, the wastes contained less than 3500 d/m/ml gross beta and 1500 d/m/ml of strontium and the plant was capable, under these conditions, of meeting the drinking water standards with a generous safety factor. However, since then the wastes have increased in radioactivity to the point where this is no longer the case. For this reason, tests are being conducted to determine the feasibility of installing a second ion exchange column to be run in series with the existing column. It is felt that the volume reduction factor will not be decreased to any extent and preliminary tests indicate an effluent well below maximum permissible concentration in drinking water. Other ion exchange resins have been ordered so that these may be tested against the ~~existing~~ CR ion exchange resin used.

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2. Laboratory

Per Philip Lang  
(Person authorizing change in classification) (Date)

Because of the large difference in MPC for  $^{89}\text{Sr}$  and  $^{90}\text{Sr}$  it is  
By Philip Lang 6/25/78  
(Signature of person making the change, and date)

desirable to be able to determine these two constituents in the Ten Site wastes. Separation of the two isotopes by ordinary means is impossible.  $\text{Sr}^{90}$  could be determined from the yttrium content except for the presence of lanthanum whose separation from yttrium is difficult. The approach being taken is as follows: determine the efficiency of the beta counter for yttrium, strontium<sup>89</sup> and strontium<sup>90</sup>. (This is being done in co-operation with John Balagna of J-Division.) Determine the relation between the gamma activity of the lanthanum as obtained from a scintillation counter and the gross beta count on our counter. (This is being done in co-operation with John Schulte of K-Division). Count a

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sample of the raw waste for gross beta. Separate yttrium and lanthanum together from the raw waste and count one portion in the beta counter and a similar portion in the gamma scintillation counter. Separate the strontium from the raw waste and count in the beta counter. Knowing the relation between gamma and beta count of the lanthanum, this result can be subtracted from the count obtained from the lanthanum and yttrium separation giving the count due to the yttrium. Knowing the efficiency of the counter for yttrium, the amount of strontium<sup>90</sup> can be determined and by relative count efficiencies the proportional amounts of strontium<sup>89</sup> and strontium<sup>90</sup> can be obtained from the strontium separation. This relation will hold true in the effluent as well and can be applied to the strontium separation in the effluent. Checks on the determination can be made since there is very little activity in the waste other than strontium, yttrium, barium and lanthanum. Other isotopes are cesium and ruthenium and these should not interfere with these analyses. The results of this method will be reported on shortly.

The low background PC-2 counters are being replaced by counters built by CMR-7 with three-inch chambers. It is expected that the new counter will eliminate some errors which were noted in the ~~past~~ ~~as~~ ~~indicate~~ a good deal of maintenance required ~~by~~ ~~the~~ ~~PC-2~~ ~~for~~ ~~U. S. E. S. D. A.~~

3. Nitrate Reduction

Per

*Philip Lang*  
(Person authorizing change in classification) (Date)

The use of a modified ~~activated~~ ~~sludge~~ ~~for~~ ~~reduction~~ ~~of~~ ~~nitrate~~  
(Signature of person making the change, and date)

nitrogen in industrial wastes is continuing. Previous work was concerned with using sugar as the source of carbon for the organisms but this resulted in a very turbid effluent and most of the sludge was lost. Recently the feed has been gradually changed to methyl alcohol with fairly good results. The sludge in this process settles much better than the sugar-fed sludge did, however, reduction in nitrates is not as efficient. It may be necessary to supplement the alcohol with some other source of carbon to provide a more balanced diet

for the organisms. To date it has been possible to reduce nitrate nitrogen from about 500 ppm to less than 1 ppm in a period of 6 hours. It is hoped that, as we learn more about the process, this reduction can be even greater.

#### 4. Environmental Studies

Two samples of water and six samples of soil were collected by personnel from USGS on July 28. The soils were analyzed for plutonium and uranium. The water samples had additional mineral analyses. The results in every case were lower than for similar samples collected in April of this year. These studies will be continued.

Samples were collected from the sewage treatment plant at TA-3 the day after the polonium incident in the Physics Building and analyzed for polonium. There was none present so apparently all of the plutonium-bearing wastes were sent to the acid sewer and ~~TA-45~~ TA-45 plant with no difficulty. ~~Classification changed to~~ **OFFICIAL USE ONLY**  
by authority of the U. S. E. R. D. A.,

#### C. Visitors

For Philip Kang  
(Person authorizing change in classification) (Date)  
Mr. Goodwin of Dow Chemical Company, Rocky Flats, spent one day with  
By Alan Reeves 6/15/78  
the Group in order to become familiar with the Group's operations, and discuss

Dr. James Ward of ORNL visited the Group on August 11 to discuss the problem of fixation of radioactivity in clay bricks.

Clyde Conover and J. E. Weir of USGS, Albuquerque, visited the Group on August 11 to discuss the proposed contract with LASL as well as their participation in our environmental studies.

Sept. 28, 1955

T. L. SHIPMAN, M. D.,  
Health Division Leader

c1A - H-Div. Files (following circulation to H-Div. Group Leaders).