1638

726773

NOTICE

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SPECIAL REREVIEW
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By: R.B. Martin

Date: 2-7-85

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COLLECTION Doc. 1944-94

BOX No. 322

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1185115

Transfile # 2

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HRE: 322

1185116

Summaries of T Poisoning (see Bio-chemical changes)

I ~~CC~~ 166 Sol Wexler + G.E. Boyd
July 9, 1942
Considers T_3O_8 a bad offender
sol. in gastric juices

II My + Mz Poisoning
CC167 Sol Wexler + G.E. Boyd
July 10, 1942

III CH 382 S.T. Cantril + J.J. Nickson
Dec. 15, 1942

IV The Effects of Irradiation on the Blood + Blood Forming Tissue CH410
S.T. Cantril, L. Jacobson + J.J. Nickson
Jan. 11, 1943
No report ending Aug 7, 1943

V CH-843. Dogs red 0.3-0.6 gm. of oxide or metal per day show no exposure evidence of tox after 2 mo. Sacrificing other dogs which have had a total of ~20 grams of oxide or metal powder blown directly into the lungs likewise remain in good health. Neither group shows evidence of stippling of red blood cells, as would be in lead given in comparable experiments.

CS-926 Basis of tolerance limit set for tuballoy dust in air: Assumption that toxicity is only chemical, and that T is same as lead in chemical effects. Nixon Friedell: Radioactivity, although very small, might be important after many years if, over years, grams of T should be deposited in body. Deposits of this magnitude occur for lead. 14 September 1943

1185117

CS-926 T may, like Pb, be stored in bones, but not yet sure.
14 Sept. 1943 Definitely stored in bones, see Report by Steadman in Rochester Progress Report #6 ~~SECRET~~

CS-1329 February 1, 1944 See Notes on [illegible] + Letters of Studies of Personnel [illegible]

Schwartz has found striking diminution in urine sulfur excretion (as sulfate) following injection of tubanyl nitrate.

This looks like the most sensitive test yet found for T poisoning .

Will continue work with smaller doses.

Stone: Warren's group (in contrast to negative results of Tannenbaum on skin of mice) found almost 100% absorption of T in ether extract through rabbits' skin (to be sure, shaved). Think similar absorption also proved for man.

recorded 5/4/44 under $TO_2NO_3)_2$

1185117 A

[redacted]

Hilberry: Hamilton willing to accept 10μg. as tolerance dose of Pu, but thinks this very conservative. Believes dust hazard far more serious than oral intake; thinks 50% of dust may be retained. Believes integration of 24 hour urine samples, checked every 2 weeks will give a fairly good indication of intake of Pu by an individual, and so a gauge of Pu deposition in body.

Conclusions based on assumption that Pu is similar to Zr.

Spedding: Points to probable importance of absorption through skin, -- analogous to skin absorption of T from ether solutions in the ether extraction method. (Hamilton has plans to study this.)

CH-1452 Month Ending March 6, 1944

At Clinton it has been found that in tanks of "average" chemical solutions 100 curies of 2 MEV beta activity the gamma radiation by Bremsstralung is the same as from ~~1~~ 1 curie of 2 MEV gamma activity. This must be taken into consideration in shipments of large quantities of beta emitters.

CS-1550 April 4, 1944
L.O. Jacobson: (for Dr. C. J. Watson)

The biggest medical hazard continues to be the handling of product. The safest procedure regarding product is to handle no product with the hands, breathe no product, and ingest no product. Its half life is 24,000 years compared to personal half life of 30 years. One might say there is no safe tolerance for product. Changes are taking place rapidly in the rooms both at Chicago and Clinton where product is being handled in such a way as to completely protect the individuals. However, you cannot protect an individual from himself; each one must be his own protector.

CH-1572 Technical Progress Report on the Metabolic Studies of Fission Products Mo. Ending Mardh 25, 1944

Incomplete tracer studies with product indicate that less than 0.05% of this element is absorbed from the digestive tract in any of the three valence states. The behaviour of plus 4 product following intramuscular and intrapulmonary administration is very similar to that of zirconium. The metabolic properties of plus 3 and plus6 product are very similar to those of yttrium and plus 3 pre product.

see Fission Products

CS-1665 May 2, 1944

Cantril: Product contamination has received much attention during the past month. The methods used for survey are similar to those used in Chicago. Air monitoring with an electrostatic precipitator has shown from 17 to 21 counts/minute/cubic meter of air. This equals approximately 2×10^{-10} micrograms/c.c. of air. ..... Dr. Parker has carried out a calculation for tolerance amounts of product in lung which gives a figure of 0.5 micrograms assuming 0.01 r per day. It is emphasized that this tolerance is for lung only.

Hilberry: If the product is not uniformly distributed in air, tolerance may be less.

Compton: Cosmic radiation gives 0.005 mr/hour. If include gammas from roc and so forth, get figure approximately 0.01 to 0.014 mr/hr as the background levels. Thus are measuring normal radiation which would get anywhere. Close to 0.02 of tolerance dose.

1185118

[redacted]

Experiment Project Medical Personnel Notes #1

Comparison of diff. exposures with x-rays of different quality + gamma rays.

CH-957 [redacted]

Chemical Toxicity of Anticipated F. P. Carriers The second series of studies on barium toxicity indicates that Ba ion (given as chloride) is highly toxic in weight concentrations of 10^{-3} and 10^{-4}, of doubtful toxicity at 10^{-5} and non-toxic at 10^{-6} and 10^{-7}. No further work is contemplated at the present time.

Doesn't say how Barium was administered.

CH-1005

Chemical Toxicity of Anticipated F.P. Carriers. An experiment designed to test the toxicity of UNH is in progress. In this experiment , seven fish were placed in two liters of the solutions indicated below. Each concentration except the lowest was duplicated. Concentrations of 10^{-3}, 10^{-4}, and 10^{-5} parts by weight of UNH killed all of the exposed fish within twenty-four hours. Concentrations of 10^{-6}, 10^{-7}, and 10^{-8} have not differed from the controls.

Radio-Dust. CH-1162 It was reported last month that a dust of LaF_3 containing long lived fission products had an average life of 20 days in the lungs of a rat. The same experiment repeated with mice gave essentially the same results. The animals were exposed to an average dust level of 0.25 mg/l or 1.5×10^{-7} curies/l. There is a wide statistical scatter in the lung activities but the 20 day average life seems to fit satisfactorily.

CH-1162 p.28

Study of a rich TX residue (St. Louis residue) to determine relative amounts of biological dose contributed by gammas + betas. Approx. 0.1% of the dose, when absorption of both in the intervening medium is negligible, is due to γ. This means approx. 1 gamma to 20 betas emitted.

CH-1260 Emission of gas from Plutonium Solutions

Sealed containers develop pressure due to alpha particle disintegration of water. 1 gram of Ra in equilibrium with short lived products liberates 86.5 cc gas per day. Also 1 gm. under conditions where most of the radon escapes liberates 20 cc gas per day. The available alpha ray energy and the ratio of half lives lead to the result that 1 gram of plutonium will yield 1.25 cc gas per day. Safe shipping conditions to prevent explosion or dissemination of the solution can be based on this.

CS-1329

Dangers of Pu are probably both chemical and radioactive, probably similar to those of Ra; 20-30 γ may possibly be a lethal dose. Present laboratory floor surfaces, desk tops, ventilation, laboratory service, inadequate to cope with this. May decide to handle under hoods, like Ra. Should plan so that all Pu can be recovered quantitatively if accidentally lost.

[redacted]

1185119

(cont.) [redacted]

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EXPERIENCE WITH PRODUCT BY SANTE FE GROUP

1. Floors may be effectively decontaminated and held to a "count " less than 100 by mopping with Ivory soap suds followed by a dry mopping. Examples:

Before mopping	5420	1512
After mopping	83	54

If floors are wooden a filler is first added, followed with a coat of paint to give a hard smooth surface.
No satisfactory means has yet been found to remove radioactive materials from within porous surfaces, and it seems unlikely that any will be discovered.

2. Material may be removed easily from relatively smooth surfaces by using clean oiled cheesecloth. The count can be reduced to less than 100 by this method.
Varnishing an impregnated surface does not completely stop alpha particle radiation or ionization of the air above. Enamelling such a surface is 100% effective.
   a. Personnel working on benches and in hoods not yet impregnated should work on wax paper and/or on glass.
   b. Personnel working on areas already impregnated should have the surfaces enamelled and covered with glass.

Glass surfaces can be decontaminated more quickly and thoroughly than other types tested.

3. High "counts" have been recorded from fluorescent lamp shades in the hall outside D-117, indicating that "49" in solution is air borne. Additional data indicate that Polonium is probably dispersed in the same manner. Dry radioactive materials are probably air-borne and remain dispersed for periods of several hours.
Dust and/or vapors of material are apparently heavy but are carried to the tops of the rooms under certain conditions. Counts of 400 to more than 3600 have been recorded from high shelves and fluorescent light shades, and ventilator intake fans in V-8.
Dust and/or vapor of the material in relatively large quantities (counts as high as 1800) settle on and adhere to vertical glass and wooden surfaces.
Oiled, glasswool filters are very effective in removing particles of meterial from a brisk air stream.

4. Some material is dispersed through the building on the shoe soles of workers. A washable covering for shoes has been supplied to every person entering the building.

5. The location of contamination on working garments indicates that it probably is transferred from gloves or hands. It is therefore advisable that personnel working with material should not touch their clothing or bodies before removing gloves and washing hands.

LAMS-130, May 31, 1944

It is interesting that the greatest danger seems to be in those laboratories working with solutions of product. The dry boxes + respirators seem to provide a satisfactory method of handling the dry material.

1185120

SECRET

Product Studies:

CH-1619 Clinton Labs. Report for Month Ending May 29, 1944

Dust Analyses:

The reason for being interested in dust concentration and particle size is because of the contamination problem resulting from fission products and product. It is likely that these radioactive particles will adhere to dust or moisture in the atmosphere.

Of eight rooms examined average dust particle size was:

5 - 10	microns	34%
2 - 5	"	29
0.5 - 2	"	23
less than 0.5	"	14

b

Comments:

1. In rooms in which air is filtered on entrance, the air coming through the filter has a relatively low concentration of dust but not a small particle size.

2. The counter room (air conditioned) has a low concentration but again a high percentage of large particles.

3. Two of the rooms have equipment washed frequently and floors hosed down every shift. Both rooms are using heavy equipment. Compared to the other locations the dust settling concentration would seem to be lower than might be expected.

4. The highest readings have been found in chemical (product) and micro-chemical laboratories- the latter being air conditioned and the laboratory in general extremely clean in appearance. Particle size in both locations is on the low side.

5. Various factors are expected to vary the dust concentration: rainfall, irregular janitor service, work in progress, leaving windows open or closed, air filtration or air conditioning, hood capacity.

6. Further studies will be done and it will be correlated with the program of clean-up which is being undertaken.

CS-776 July 12, 1943

~~SECRET~~

Found 4r/day (8 hr. day) made serious effect on guinea pigs, whereas 8r/day gave no noticeable effect on mice. Shows different animal species have different sensitivities.

CH-843 - Total body radiation experiments on a few people have shown that there were no subjective effects from doses of 30, 60, or 120 r. However, as proof that the subjective effect is not an indication of objective damage, the patients getting 60 r and 120 r did show definite effects on the white blood cells + platelets.

CH-843 With external Beta rays from bombarded nitrate, two rats had received 550 r in 25 days and 5 mice had received 415 r in 23 days. All animals appeared healthy. They were sacrificed over a period of two weeks following exposure. No gross pathology could be detected. Slides of skin and other organs are being prepared.

CH-843 Meeting Aug 6, 1943

x-rays generated at 400 kv. filtered through 3 mm. Cu.
To date 6 patients treated with single exposures ranging from 30 - 120 r. Dosage rate is ~ 1 r/min

1. No radiation sickness
2. 30 r produced no striking effect noted within 21 days
3. 3 of 4 - 60 hr. exposures produced leukopenia in 2-4 hrs and a drop was to 50%
   the 3 recovered from 4-14 days normal white blood count.
4. Lymphocytes have remained in a depressed level ~ 40%
5. Platelet level fell with gradual return.

CS-857 Discussion of above

Experiments on six patients who were given 30,60, and 120 r of 400 kv radiation at the rate of about 1 r/min. produced no radiation sickness, nausea or fatique. One patient reported feeling better. 30 r produced no effect on white count. 60 r produced an immediate drop in white count to as low as 50%. Less conclusive results were obtained with 120 r. These were cancer patients who have been previously given local treatments but not recently.

Does this mean that radioactivity not as bad as feared:

1185122 Probably not. Applies only to single dose and not to continued exposure. In other cases 50 r/day repeated on successive days produces nausea on second day but no effect on third or fourth day. Radiation sickness is not understood.

Experiments with Radiation

[redacted] #2

~~CS-471~~ Lab Council - Information Meeting. Feb. 9, 1943

I 5r per day given on 5 days per week, each x-ray treatment taking in the neighborhood of one minute results in 25r per week which, if continued, results in the death of the animal in from 5 to 9 mo.

II On the other hand, 4r per day given continuously in the 24 hours and on 7 days a week, resulting in 28r per week can be given for indefinite periods with no demonstrable harmful effects except some changes in the gonads.

Drosophila eggs & bacteria can be used as a direct test for radiation inside of shielding

Egg exposures can be made inside of 2 hrs.
Bacteria " require probably a day

Days or so after exposure to make the counts

~~CS-565~~ ~~0.1r corresponds~~ to 2

CH 619 Radiation Hazards from x-metal H.M. Parker June 30, 1943.

CS-714 With 25 r/week in flashes of less than 1 min., animals lives shortened.
28r/week continuously, no effect noted

600r of total body radiation will kill a man, but 72,000r total local radiation was given at Pasadena without great harm.

4r/week in 20 min of β ray is known to have produced skin damage

Clinical wilence indicates essentially same effects for β rays as for soft x rays

1185123

[redacted]

CH-1089 - Mo. Ending Nov. 29, 1943

Destruction of the gonads precedes significant changes in the blood picture. Therefore the blood picture cannot give sufficient indication as to radiation damage.

CH-1162 Month Ending Dec. 25, 1943

A 67 year old male with a carcinoma of the right thumb and probable metastases received 75 r on 11-26 and 75 r on 11-27-43, a total of 150 r, total body radiation. The fall of lymphocytes from about 1800 to 500 per cu. mm. constituted the chief change observed. The total WBC count has fallen from about 6500 to 3000.

The cephalin-cholesterol test which had been strongly positive before and shortly after exposure became negative two weeks after treatment. Total urine sulfur concentration fell from about 70 mg. per cent to less than 20 mg. per cent within three weeks after treatment.

On 12-16, 17, 18 he received further daily doses of 50 r total body radiation. Complete results of this series of treatments are not yet available. It might be noted however, that within 4 days his urine urobilinogen and blood cephalin-cholestrerol have become more strongly positive.

Biological Research Section - K.S. Cole, Section Chief

x-ray: Paired Doses; Rabbits

The question of the time and extent of recovery from radiation exposure has been raised repeatedly. Rabbits which survived single doses of 500, 600 and 700 r for over 100 days recovered to essentially normal blood pictures and weights. These were given a second irradiation of 800 r. Of sixteen animals, eight died in six days or less, one in 12 days and the rest have survived up to as much as 24 days. This indicates that within 100 days there is marked recovery from irradiation damage because 1300 - 1500 r given at one time would have killed all of the animals. Present indications are, however, that those which died did so much sooner than they would have in the absence of previous radiation.

Page 17 - New observations made of changes in rabbit bone marrow following single doses of 800 r.

Protection against radiation damage by nicotinic acid - C.L. Prosser

It is concluded from the experiments that NA given prior to radiation prolongs survival. These results could be explained by assuming that nicotinic acid is required for the synthesis of the essential coenzyme DPN (known as DPN; diphosphopyridine nucleotide) and that radiation destroys the enzymes which synthesize DPN.

CS-1193 Review of CH-1162

Spedding: Do larger animals stand bigger or smaller doses?

Stone: Cole: Data not conclusive, although guinea pigs seem to stand less.

Irradiation of purified enzymes produced no effect in the case of 2 enzymes and one coenzyme, but did some harm to tissue catalase, less to blood catalase. ~~Evidence~~

N.C.I. report (CH-1162 supplement)

1) As was reported last month, spermatogenesis can be disrupted without blood changes. New result: after 8 weeks, 2 male mice recovered from 1600 r doses enough to breed.

1185124

[redacted] #2-2

CS-857 Information Meeting (Health) August 10, 1943

Approximate confirmation of fact that 1,000 r of X-ray will kill ordinary mouse in four days. A live mouse was put in Argonne pile for 10 kw hours, radiation dosage was 600 to 900 r.

**********CH-908 Report for Month Ending Sept. 4, 1943 **********

The Medical Committee of the Manhattan District, composed of Dr. Stafford Warren, Dr. R.S. Stone and Dr. Hymer Friedell has tentatively set a local skin tolerance dosage of 0.5 r per day for beta ray exposures. It is emphasized that this is for the hands, for localized exposure and for beta rays. Dr. Parker's measurements have shown that direct contact with the bare metal gives roughly 0.25 r per hour. Thus, two hours contact ~~with~~ gives a tolerance dose. There are very few operations which require more than two hours direct contact with the metal.

CH-946 Radiobiological Importance of Specific Ionization
K.E. Zeirke Sept. 21, 1943
Should read + utilize some of discussion on diff. types of radiation.

CH-957 A survivor is defined as a fish which lives 28 days after exposure. The survival curve, ~~A survivor~~ shows that the 50% lethal dose is slightly below 800 r; this experiment was done for goldfish.
Chronic exposures are now underway.

CH-1005 50% x-ray dose for rats 600r-700r
plateau reached for rats. Longest survival - 24 days after 200r.

page 29 Mice receiving approx. 1600r at the rate of 8r/per 8hrs. per day shows a decrease in RBC + WBC. Rate of 4r, 2r, 1r, 0.1r, per 8hrs. per day show an essentially normal blood picture. Approx. same picture for guinea pigs.

Male mice exposed to 1600, 1000, 800, and 600r on the 8r per 8hr per day level 50% of which autopsied showed testicular damage. Other 50% produced normal litters.

Male mice exposed to 1000, 800, + 600r on the 4r, per 24 hr. per day showed no testicular damage.

Female mice exposed on different levels (8r, and 4r per 8 hr. per day and 8r, 4r, 2r, and 1r per 24 hrs. per day) to doses ranging from 600-1000r gave birth to normal litters + their ovaries showed normal.

[redacted]

1185125

Failla gives 3×10^{-10} curies per cc. as tolerance level for 2 to 1 MEV betas. Feels is safe to use above tolerance figures.

Cole: One-half time for elimination of radio-LaF_3 is twenty days. 20% retention of material breathed.

Nickson: Particle size distribution of T dust from machining process is from 0.01 to 1 μ diameter. Majority of particles less than 1 μ will stay in lung.

Allison: 5 micrograms tolerance in lungs is the figure taken as lethal dose.

Cole: Using figures given above for La, 100 micrograms in air is tolerance for production.

Pardue: Since methods of collecting dust from air may not be 100%, it is best to hold tolerance figure as low as possible.

CH-1470 Month Ending Feb. 29, 1944 Page 4

Liver function tests (colloidal gold, cephalin-cholesterol, and formol-gel) have shown some positive reactions in personnel exposed to radiation and toxicological hazards, but the tests have not yet been tried widely enough to gauge their significance.

Pigment metabolism studies show that (a) project workers exposed to lead or radiation tend to have definite increase in red blood cell protoporphyrin, (b) no essential change in urine coproporphyrin, (c) 17 out of 43 project workers showed positive urine urorosein tests compared to 1 of 12 controls.

Kidney function tests by urine sulfur excretion methods have been negative so far as personnel are concerned but positive for rabbits receiving relatively large injections of tubanyl nitrate.

Initial studies of blood proteins by the electrophoretic method indicate some changes possibly due to radiations.

CS-1550 April 4, 1944
L.O.Jacobson: (for Dr. C.J. Watson)

Dr. Schwartz's study on the effect of irradiation on blood phosphorus has continued. A micro technique has been developed. It is thought that the most significant function is the nuclear protein + the lipoid phosphorus. Human studies on project exposed personnel all show significant increases. In controls and medical students no elevation has been found. 26 project workers show mild elevation. One normal individual exposed to 16 r total at 1 r per day showed a significant rise beginning the eighth day after the onset of radiation.

COMPTON:- Surprising to find clear test for radiation which does not parallel the dose.

JACOBSON:- No other examples. Test as yet tentative

FRANCK:- May fit into enzyme system with sensitivity threshold effect.

[illegible] little done on normals as yet.

1185126

[redacted]

exper. #3

[redacted]

B. CHEMICAL EFFECTS FROM IRRADIATION

1. Action on photo emulsions.
2. Liberation of I_2 from iodide solutions.
3. Oxidation of ferrous sulfate.
4. Precipitation of HgCl from Eder's solution.

of more significance:

1. Decomposition of water into H_2 and O_2
2. Synthetization of H_2O_2 from water having O_2 in solution.
3. The oxidation of oxyhemoglobin to methemolgobin.
4. Precipitation of proteins.
5. Inactivation of enzymes.

The Illinois Dept. of Health gives 0.1 mgm. of Hg per cubic meter of air as the tolerance figure
CH-957 page 14 Sept. 25, 1943

CS-1462 March 7, 1944

The methods of detection of incipient damage either chemical or radiation were discussed. Several tests are now used. A score is made from these tests. It is felt that it is now possible to say that a man has had damge. The question of the origin of the damge, whether chemical or radiation, is not settled. The tests used are:

1. Cephalin-cholesterol
2. Colloidal gold
3. Red Blood cell protoporphyrin
4. Urine coproporphyrin
5. Urorosein and associated pigments
6. 510 mμ absorption band.

The fact that the data at present are difficult to interpret because of previous exposure to toxic agents was emphasized.

The 510 mμ absorption band may possibly be caused by a tuballoy complex, found so far only in Site B workers.

Schwartz has developed a method of investigating nucleoprotein phosphorus of leucocytes. Normal range per million leucocytes less than 0.5 gamma. Radiation-exposed project workers have shown values greater than 0.75 gamma, in some instances greater than 0.1 gamma.

* ** ** ** ** ** ** ** ** ** ** ** **

Production hazard has received some attention during the month. Allison has given 5×10^{-6} alphas per sec. per cc. air as a tentative tolerance figure for 48 hours a week exposure for two years.

Energy absorption measurements on Argonne gas show maximum energy 3 MEV beta. Rapid decay in 40 min. to 10% of initial counting rate.

1185127

[redacted]

SECRET

CH-1433 April 29, 1944

In mice surviving more than 5000 r skin dosage, almost complete epilation occurs at 3-4 weeks, accompanied by severe erythema. Recovery is progressing.

CH-1674 - Project Wide Activities in Clinical Medicine Medical Research and Biological Research. For period ending 30 April 1944

Inhibition of hair growth in suckling mice has been obtained with internal beta ray exposures of approximately 400 r from a small Sr^{89} source.

CH-1673 Metallurgical Lab. Report for Month Ending April 25, 1944

See CS 1000 [illegible]

Average lethal dose of guinea pigs on the 8 r per 8 hour level of 1st series is 800 to 1700 r.

The guinea pigs on the 4 r per 8 hour level show persistent low values of all counts. One more had to be killed during the month due to rapidly developing anemia, bringing the total of those which were killec due to anemia up to 5. The lethal dose of these 5 guinea pigs ranged from 900 to 1500 r.

All other experimental guinea pigs on the lower levels show essentially normal blood picture.

Breeding experiments revealed that male mice exposed to 800 r on 8 r per 8 hour level are capable of producing normal litters although their testes show histologically consider able damage (decrease in size to ½, compolete destruction of some tubules while other tubules are normal, and diminished sperm content of the epididymes).

The early experiment in which C3H mice were exposed to 4 r per day to a total dose of approx. 400 r was repeated. Like in the first experiment it was found that females of this strain become permanently sterile after an exposure to 400 r, while the males remain fertile. A repitition of the first experiment is likewise being run using another strain of mice: strain dba.

One male and one female mouse exposed to 8 r per 8 hours daily for a total of 2900 r and 2800 r, respectively had malignant lymphomas originating in the thymic region. Ovaries were devoid of follicles. Testes had extreme tubular atrophy but a few spermatogenic cells were present.

One female mouse exposed to 0.1 r per 8 hours daily for a total chronic exposure of 39.5 r plus an acute exposure of 50 r had ovaries devoid of follicles.

Four guinea pigs exposed to 8 r per 8 hours daily for a total of 800-1000 r presented a uniform picture of extensive ecchymoses in the proximal half of the small intestine, moderate to marked bone marrow atrophy, no apparent ovarian changes but extreme tubular atrophy in the testes. No additional changes were observed in one male guinea pig that had been exposed to 4 r per 8 hours daily for a total of 1500 r.

1185128

EXPER.

SECRET

CB-1665 May 2, 1944

Curtis: (Clinton) MLD for death in 30 days = 10,000 r

Results of beta ray work on mice now avilable. Divide into 3 general results: in exposures above 10,000 r, the animals die in approximately 14 days. Cause undetermined as yet. Less than 10,000 r, animals live (8 weeks to date). At 21 days hair falls out. Skin is reddenedd, scaling. At approximately 6 weeks the hair reappears. Less than 5,000 r, see little effect. Rabbits had eye exposures to 8,000 r. No effect noted to date.

see

Compton: Source of radiation?

Curtis: P^{32}. Red phosphorus imbedded in lucite. However, lucite does not withstand radiation. New means of obtaining beta sources must be found.

Spedding: How do the animals die?

Curtis: Active until a few days before death. Weight curve similarly.

CJ.Watson: There is a magnesium and lime hazard also. Magnesium must be considered in porphyrin metabolism abnormalities.

Dr. Barron has found that succinoxidase is inhibited by 5,000 r and is reactivated following the addition of glutathione. 3 other enzymes have been studied. None show complete inactivation. Spleen, liver and thymus tissue metabolism has been studied on tissue slices obtained from rats which had been given 100 r total body radiation. At this level inconstant reduction in metabolixm is found.

Watson: More radiation necessary to inactivate enzymes irradiated outside the body than in the body.

Jacobson: (for N.C.I.)

Mice exposed to 8 r per 8 hour day have now shown 8 animals which have developed malignant lymphomas. No lymphomas in the control group. 2 animals in the 2 r per 8 hr day have also developed lymphomas.

see 1673 next page

Guinea pigs exposed to 8 r per 8 hr day have died after receiving betweeen 900 and 1500 r. 4 r/8 hr day exposure has resulted in death after the same total dose. All animals which have died have developed a marked anemia shortly before death.

Fertility studies on mice have shown normal male fertility after 800r. Histological study shows marked destruction of tissue in ~~[illegible]~~ of the testes. 4 r/24 hrs to a total of 400 r has resulted in sterility of the females. The males are still fertile.

Cole: (Biology)

X-ray studies have been confined to the recovery of animals from the effects. The work with rats after 300 r shows 43% recovery in 1 week and 67% recovery in 2 weeks. Thus the half time of recovery is 8.5 days.

X-ray studies with rabbits after 4 months following 500 to 900 r total body showed initial mortalities of from 1 - 75% with increasing dosage. After 4 months recovery percentage ranged from 42 - 100%.

Rabbits exposed to 100 r show diminished mitotic activity and destruction of small lymphocytes during the first 8 hours. After 3 days virtually impossible to tell the irradiated from the control animals.

1185129

CH-1433 Clinton LAB Report

Natural radiation in this area (.0012 - 0.16 mr/hr, or 7 to 9.4 ip/cc/sec. Measurements on adjacent hills have not yet given values in xs of 0.04 mr/hr.

[redacted]