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DIRECTOR OF SHIP MATERIAL

BUREAU OF MEDICINE AND SURGERY RESEARCH GROUP

REPORT

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ANALYSIS OF TISSUES FOR INDUCED RADIOACTIVITY

AD No. 473894

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APPENDIX NO. 17

TO THE FINAL REPORT

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OPERATION CROSSROADS

JOINT TASK FORCE ONE

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DIRECTOR OF SHIP MATERIAL
NAVAL MEDICAL RESEARCH SECTION

6 OPERATION CROSSROADS, ^{1 August 1946}
ANALYSIS OF TISSUES FOR INDUCED RADIOACTIVITY.

~~Report of Naval Medical Research Section, Joint Task Force ONE, on Biological Aspects of Atomic Bomb Tests.~~

9 APPENDIX No. 17 to Final rept.,
by

10 C. Ladd Prosser,
Argonne National Laboratory

11 1 Aug 46,

12 3 p.

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Officer-in-Charge

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Measurements made on a variety of tissues during the first week after test ABLE indicated significant activity in bone from one goat from the USS NEVADA but not from animals in other locations, and not from soft tissues of the NEVADA goat. Tissue weights were not obtained, however, and results were not comparable from animal to animal.

In the present series, bones (femur and tibia usually) were weighed, ashed, the ash dissolved in dilute hydrochloric acid, the acid evaporated and the samples counted with a mica window GM tube. Results are given in accompanying tables in terms of counts per second above background on the day measured and as calculated for ABLE day by assuming that the active material was P^{32} .

These tables show that the specific activity was greatest in animals from the USS NEVADA and that it was significant in animals from the USS INDEPENDENCE and USS SALT LAKE CITY. No significant induced radioactivity was found in bone from animals from the USS PENNSYLVANIA, FILLMORE, BRACKEN or WAINWRIGHT. The results for the FALLON and CATRON are of borderline significance. The total counts on the samples from these two ships were frequently less than twice background and the standard error is large. Background measurements vary by a factor of two and backgrounds obtained with a capsule in place exceeded those without a capsule. Hence the experimental value varied according to what background value was used. If the samples had been taken earlier or had been counted for longer times, significance might be established. One overnight count was made on a bone from a CATRON goat and appeared to show significant activity. It can be tentatively concluded that the FALLON and CATRON were at the border area of sufficient neutron flux to induce detectable radioactivity in bone.

It has been assumed that the radioactivity measured is induced by thermal neutrons. Fission products are apparently excluded by the lack of activity in soft tissues, its absence from distant animals and by the general absence of fission products on the animals as removed from their stations. Identification is being attempted by determination of decay curves. Measurements on three successive days indicate a slope corresponding to a half-life of 14.3 days, that of phosphorus. The amount of radioactivity is too low for absorption curves.

On the assumption that the measured radioactivity is due to P^{32} it has been calculated, correcting for 18.57 geometry, there were 10.36 cts/sec/gm. of bone or 2.8×10^{-4} $\mu\text{c/gm.}$ bone in NEVADA animals at time Zero. Taking a mean phosphorus content of bone as 9 percent, this means that there was induced activity corresponding to 3×10^{-3} $\mu\text{c/gmP}$ in bone of animals on the NEVADA. This amount of radioactivity is negligible for the point of view of damage to the animals but the above figures can be used for calculating neutron dosage when appropriate constants are available.

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<u>Species</u>	<u>Animal Number</u>	<u>Location</u>	<u>Total cts/sec -bkg.</u>	<u>cts/sec/gm. (wet)</u>	<u>cts/sec/gm at tg assuming P³²</u>
NEVADA 772 yards from burst					
rat	1284	24	0.926	0.750	1.172
rat	1285	24	1.644	1.121	1.753
rat	2081	35	1.194	1.016	1.588
rat	209	42	1.766	1.238	2.060
pig	212	35	6.598	1.195	1.867
pig	240	35	4.996	.859	1.408
					<u>1.641</u> avg.
INDEPENDENCE 679 yards from burst					
rat	349	36	0.742	0.709	1.107
rat	2013	35	0.805	0.558	0.915
					<u>1.011</u> avg.
SALT LAKE CITY 998 yards from burst					
rat	2259	22	0.192	0.301	0.470
rat	2291	22	0.364	0.270	0.422
rat	2358	22	0.323	0.334	0.522
rat	2295	22	0.394	0.389	0.608
rat	12		0.237	0.180	0.281
					<u>0.461</u> avg.
FALLON 1396 yards from burst					
rat	552	43	0.250	0.150	0.230
rat	554	43	0.213	0.085	0.133
rat	301	43	0.208	0.130	0.203
rat	blast 1		0.214	0.110	0.172
rat	blast 2		0.154	0.072	0.112
rat	blast 3		0.123	0.094	0.147
rat	blast 4		0.121	0.156	0.233
rat	blast 5		0.090	0.108	0.161
rat	blast 6		0.265	0.283	0.422
rat	538	42	0.316	0.258	0.423
rat	537	42	0.384	0.314	0.514
rat	536	42	0.220	0.206	0.337
					<u>0.257</u> avg.
CATRON 1873 yards from burst					
rat	blast		0.163	0.125	0.205
rat	blast		0.412	0.416	0.682
rat	blast		0.221	0.193	0.316
rat	blast		0.384	0.384	0.629
goat		43	0.455	0.061	0.105
					<u>0.387</u> avg.

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<u>Species</u>	<u>Animal Number</u>	<u>Location</u>	<u>Total cts/sec -bkg.</u>	<u>cts/sec/gm. (wet)</u>	<u>cts/sec/gm. at t8 assuming p32</u>
PENNSYLVANIA 1724 yards from burst					
rat	blast		-0.076		
rat	blast		-0.023		
rat	blast		-0.052		
rat		38	0.380	0.364	0.543
goat	102	03	0.104	0.006	0.009
FILLMORE 2549 yards from burst					
Guinea pig	2	43	-0.016		
Guinea pig	3	43	0.099		
BRACKEN 2142 yards from burst					
rat	805	63	0.002		
WAINWRIGHT 2196 yards from burst					
pig	221	34	-0.109		
ENIWETOK					
rat	553	plane	0.002		

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