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Effect of Carbon Arc Radiation on Resistance of Rachitic Rats to Tetanus Toxin.*

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That sunlight increases the resistance of rachitic rats to specific infections has been shown.^{1, 2} In view of the known variations, daily and seasonal, in solar energy, it seemed desirable to study the effects of a more constant source of radiant energy.

The flaming C arc (Pan Ray), which has been used in this work when operated at 25-28 A, 55-60 V emits a total energy of 0.797 g. cal. per sq. cm. per minute incident at a distance of 1 meter, which is distributed as follows: ultraviolet 12, luminous 35, and infra-red 53%.³

The animals used were albino rats of the uniform Wistar Institute strain. The members of the different litters were evenly distributed among the test and control groups. All the animals received the same rachitogenic diet (McCollum 3143) for 50 days. During this period, Groups I, III and IV were irradiated daily for 20 minutes at 1 meter distance, thus receiving 16 g. cal. per sq. cm. This amount of radiation was sufficient to prevent the development of rickets in rats receiving the rachitogenic diet. After 50 consecutive irradiations the animals were skiagraphed to determine that there were no rachitic bone lesions, and were then injected with varying amounts of tetanus toxin (Table I). Control groups II and V received similar injections of toxin but were not irradiated. Roentgenograms of these rats showed marked rachitic lesions.

The toxin solutions were injected into the muscles of the thigh and were always freshly prepared from a stock of dried tetanus toxin. It is shown in Table I that the resistance to tetanus-toxin of the irradiated rats was much greater than that of the non-irradiated controls.

Observations on work being performed in this laboratory, although not final, suggest that C arc irradiation for 20 minutes daily at 1 meter, increases the susceptibility of normal rats to tetanus toxin.

* I wish to express my gratitude to Professor Henry Laurens for his helpful suggestions and for the use of the arc.

¹ Robertson, E., *Can. Med. Assn. J.*, 1927, xvii, 1033.

² Brown and Tisdall, *Can. Med. Assn. J.*, 1927, xvii, 1425.

³ Laurens, H., and Mayerson, H. S., *Radiology*, 1929, xii, 328.

TABLE I.

Rat	Wt. gm.	Irradia- tion 20 min. 1 meter	Rachito- genic Diet	Tetanus Toxin mg. per 100 gm. Rat.	Remarks.
I-341	54-90	50 days	50 days	.005	Slight local tetanus. Recovery.
I-342	60-98	" "	" "	.01	Severe local tetanus. Recovery.
I-343	58-82	" "	" "	.005	Slight local tetanus. Recovery.
I-344	60-70	" "	" "	.01	Severe local tetanus. Recovery.
I-345	26-44	" "	" "	.02	Died—5 days after injection.
II-346	44-	0	" "		Died. Severe rickets.
II-347	48-80	0	" "	.0005	Normal.
II-348	48-78	0	" "	.001	Died—4 days after injection.
II-349	28-56	0	" "	.01	Died—3 days after injection.
II-350	26-60	0	" "	.005	Died—3 days after injection.
III-361	56-80	50 days	" "	.02	Died—5 days after injection.
III-362	62-94	" "	" "	.01	Local tetanus. Recovery.
III-363	54-86	" "	" "	.005	Local tetanus. Recovery.
III-364	50-74	" "	" "	.001	Slight local tetanus. Recovery.
III-365	60-96	" "	" "	.0005	Normal.
IV-371	54-82	" "	" "	.02	Died—3 days after injection.
IV-372	48-69	" "	" "	.01	Local tetanus. Died 11 days after injection.
IV-373	52-84	" "	" "	.008	Local tetanus. Recovery.
IV-374	62-88	" "	" "	.001	Very slight local tetanus. Re- covery.
IV-375	56-86	" "	" "	.0008	Normal.
V-366	64-94	0	" "	.02	Died—3 days after injection.
V-367	62-89	0	" "	.01	Died—4 days after injection.
V-368	50-77	0	" "	.005	Died—3 days after injection.
V-369	70-98	0	" "	.001	Severe local tetanus. De- stroyed on 25th day.
V-370	68-96	0	" "	.0008	Severe local tetanus. De- stroyed on 25th day.

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Radiological Study of Motility of Gastro-Intestinal Tract of Rachitic Rats.

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Although rickets is a disease primarily affecting the skeletal parts it nevertheless produces abnormal changes in the entire body. It is usually associated with muscular weakness and relaxation and since one of the early symptoms of rickets is constipation, the following experiments were planned to compare radiologically the motility of