

Activity of Thyroid Gland During Fasting and Realimentation with Diets High in Carbohydrate.* (23861)

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When normal dogs are subjected to a prolonged fast the blood pressure and pulse rate decline to low stable fasting levels which remain quite constant for prolonged periods(1). If they are realimented with a diet high in carbohydrate fed at the luxus consumption level of 120 cal/M²/hr, they develop a high systolic pressure and rapid pulse with a low or normal diastolic pressure which will usually persist as long as the diet is eaten(2). Since the latter hemodynamic pattern is similar to that seen in hyperthyroidism and can be produced in normal dogs by feeding thyroid powder, the present studies were undertaken to determine whether increased thyroid activity is the causative factor.

Methods. Thyroidectomy with preservation of the parathyroid glands in dogs, often leaves thyroid remnants, hence, this method of approach is uncertain. For this reason it was decided to determine the activity of the thyroid gland by serum protein bound iodine and I¹³¹ uptake. Six adult normal dogs (2 males and 4 females) were studied. Two of the animals (1 male and 1 female) were trained and standardized for blood pressure studies. Protein bound iodine was determined by the Leffler method as modified by Reals, Townsend, and Danielson(3,4). At the suggestion of Reals, the method was modified by precipitation of the serum protein with 10% perchloric acid (70-72%) instead of trichloroacetic acid. Radioactive iodine uptake was determined in the usual way 24 hours after intravenous injection of 10 mc of I¹³¹.[‡] Blood pressure was determined by the auscultatory

method of Allen(5) with certain modifications and improvements(1,6). **Dietary procedures.** During the control and thyroid feeding periods each dog was fed the usual kennel diet of Nutrena dog food. The fasting period, water *ad libitum*, lasted for 29 days on the 2 dogs on which blood pressure was studied and for 50 days on the remaining 4 dogs. Following the fast the animals were all realimented with a diet high in carbohydrate consisting of cracker meal or boiled white rice§ moistened and flavored with Difco Beef Extract and fed at the luxus consumption level of 120 cal/M²/hr. One tablespoon of Brewers yeast was added to the diet and one multivitamin tablet|| was administered daily. After the 2 blood pressure dogs had recovered from the dietary experiments there were given 0.9 g/kg/day of USP thyroid powder #58, mixed with the kennel diet for 16 days. Eleven to 12 determinations of PBI were done on each of the 6 dogs during the control period and from 6 to 10 determinations during the fasting and high carbohydrate diet periods respectively. On the blood pressure dogs 8 determinations were done during the period of thyroid powder administration. On 4 dogs not used for blood pressure studies I¹³¹ uptake determinations were done as follows: on the control diet the day before beginning the fast; on 50th or last day of fasting and on 28th day of high carbohydrate diet.

Results. (A) *Cardiovascular studies.* The figure shows 2 experiments on the same dog. (A) shows the values for blood pressure and heart rate during the control, fasting and realimentation periods. The high systolic pressure with a rapid pulse and low or normal diastolic pressure caused by realimentation

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§ Rice and cracker meal have the same hemodynamic effect when fed after long preliminary fast.

|| Multicebrin (Lilly) contains daily human requirement of main vitamins.

TABLE I. Activity of Thyroid Gland during Fasting and Realimentation with Luxus Consumption High Carbohydrate Diets.

Dog	Protein bound iodine, u/100 cc							Radioactive iodine uptake, %				
	Control	Fasting*				L C carbohydrate*			Control	Fasting†		L C carbohydrate†
I	2.9	3.4	+5	P>.1	1.7	-1.2	P<.05	12	9	-3	15	+3
II	3.3	2.6	-.7	P=.1	2.2	-1.1	P"	9	13	+4	18	+9
III	3.4	3.4	0		2.0	-1.4	P<.02	5	14	+9	14	+9
IV	3.1	2.9	-.2	P>.1	2.1	-1.0	P>.05	11	6	-5	14	+3
V	2.2	2.8	+6	P>.05	3.1	+9	P>.1					
VI	3.0	3.1	+.1	P>.1	1.6	-1.4	P<.1					
Mean	2.98	3.03			2.12							

* Difference from control mean and significance of the difference.

† Difference from control mean.

Blood pressure studies were done on dogs V and VI.

with the high carbohydrate diet is a characteristic response. (B) shows the cardiovascular response to the feeding of thyroid powder. The dietary and hormonal responses are qualitatively and quantitatively very similar and both disappeared promptly when the causative agents were discontinued. In the dietary experiments the PBI values ranged between 2 and 3 $\mu\text{g}/100\text{ cc}$ while during thyroid feeding the values were consistently above 15 $\mu\text{g}/100\text{ cc}$. When thyroid feeding was discontinued the PBI values remained above the control level for two weeks while the systolic pressure and heart rate returned to normal in 5 days.

(B) *Protein bound iodine studies.* The Table shows the mean values on each of the

6 dogs during the control, fasting and high carbohydrate diet periods. During fasting the values decreased in 3 dogs, remained the same in one and increased in 2. The probability of the differences from the control values was calculated from *t* and none was significant at the 5% level of confidence. During realimentation with the high carbohydrate diet, the mean values decreased in 5 dogs and increased in 1. The decreases below the control values were significant at the 5% level of confidence or less in dogs I, II, III and VI but not in dog IV. The increase in dog V was not significant.

(C) *Radioactive iodine uptake.* During fasting there was an increase above the control value in 2 dogs and a decrease in the other 2 dogs, but the differences which range from -3 to +9% were not considered sufficiently large to be significant. During realimentation with the high carbohydrate diet there was an increased uptake in all 4 dogs but the magnitude of the increases (+3 to +9% was considered too small to be significant.†

Summary and conclusions. 1) Activity of thyroid glands of dogs as determined by serum PBI and I^{131} uptake is not significantly altered during prolonged fasting or realimentation with diets high in carbohydrate. 2) The high systolic pressure and rapid pulse with low or normal diastolic pressure which is produced by a diet high in carbohydrate fed at the luxus consumption level of 120 cal/ M^2 /

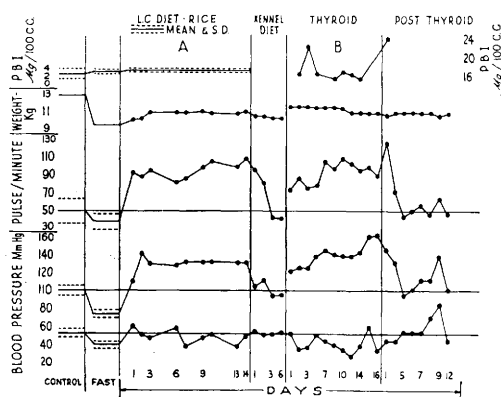


FIG. 1. Blood pressure studies on Dog V.* (A) Effect of realimentation with boiled white rice after fast of 29 days. Fasting values are the mean of last 5 days which represent low stable fasting level. (B) Effect of thyroid powder.

* Similar studies on Dog VI gave identical results.

† Dr. Richard E. Ogborn of Radioisotope Laboratory of Omaha Vet. Adm. Hospital examined the data and agreed that the changes were not significant.

hr after a prolonged fast is strikingly similar to the hemodynamic effect of thyroid powder but it is not due to increased thyroid activity according to the indices studied.

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Chronic Latent Infections of Birds with Western Equine Encephalomyelitis Virus.* (23862)

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The endemicity of arthropod-borne viruses such as Western equine encephalomyelitis (WEE) and St. Louis encephalitis (SLE) in temperate areas indicates the probable existence of a long-term arthropod or vertebrate reservoir of infection. Past studies have indicated that both avian hosts and mosquito vectors are essential in the summer transmission of many of these viruses. This paper reports the finding that WEE virus may persist as a chronic latent infection in experimentally infected birds and the epidemiological significance of this observation.

Materials and methods. Wild birds of several species were trapped in the fall and winter of 1953 to 1956, leg banded with identifying numbers, and held in a mosquito-proof outdoor aviary for the duration of the experiments. A pre-inoculation blood sample for antibody determination was obtained by jugular puncture, and within a few days each bird was inoculated subcutaneously with 0.1 or 0.2 ml of 100 to 15,800 mouse LD₅₀ concentrations of BFS 1034, BFS 1703 or F 199 strains of WEE virus. The strains were originally isolated from naturally infected mosquitoes or mites and had been through 3 or 4 serial mouse brain passages. One or more post-in-

oculation blood samples were taken at intervals of 1 to 5 months, and if possible a final blood sample was collected at autopsy. All blood samples were drawn by jugular puncture into a syringe containing heparin diluted in sterile phosphate buffer saline (pH 7.4). The concentration of heparin was 20 U.S.P. units per ml, and for each ml of blood 0.2 ml of heparin solution was used. Blood plasma was tested for neutralizing antibodies to WEE virus, and as a control for SLE neutralizing antibodies when sample size permitted. The neutralization tests were made in 21-day-old mice with a level of 50 MLD₅₀ of virus, and when sufficient plasma was available a second level of 500 MLD₅₀ of virus. Neutralization indices above 50 were considered positive, 10 to 49 equivocal and below 10 negative. Birds were subjected to autopsy when found dead in the aviary or when sacrificed by bleeding out. When birds remained in good health, they were held for a minimum of 6 months after infection and a portion was then sacrificed for sampling at intervals extending to 10 months post-inoculation. At autopsy separate sterile instruments were used for each bird but not for each organ sample. From each bird the following tissue samples were usually taken: brain, heart, kidney, spleen, lung, liver, lymph and whole heparinized blood. Occasionally fewer or additional sam-

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