

Effect of Growth Hormone on Temporal Muscle of the Guinea Pig.* (17691)

CHARLES D. KOCHAKIAN AND EVANGELINE ROBERTSON.

*From the Department of Physiology and Vital Economics, School of Medicine and Dentistry,
University of Rochester, Rochester, N.Y.*

The ability of testosterone propionate to stimulate growth of the temporal muscle of the castrated male guinea pig(1) has been confirmed and extended to other steroids(2). Thus another site of protein synthesis under androgen stimulation has been established. Since the growth hormone of the anterior pituitary also is a powerful stimulator of protein anabolism(3,4), it seemed worthwhile to determine whether this hormone could also stimulate growth in the temporal muscle of the guinea pig. Certain definite differences in the protein anabolic actions of androgens and growth hormone have already been demonstrated(4-6).

Procedure. The guinea pigs were of the Hartley strain and were obtained at 325-375 g body weight from the Tumblebrook Farms. They were placed in individual cages and fed Rockland guinea pig diet containing vitamin C *ad libitum*. Once per week each animal was given 12.5 mg of vitamin C by mouth. When the guinea pigs reached 395-405 g body weight they were castrated. Thirty to 35 days later the growth hormone was injected subcutaneously at approximately 5 p.m. of each day for 14 days. On the morn-

ing of the 15th day the animals were killed and the seminal vesicles and prostates and the temporal muscles were removed and weighed on a Roller-Smith torsion balance. The guinea pigs were weighed 3 times per week beginning on arrival and also at time of autopsy. Any animal that did not show a good growth response was discarded. The growth hormone was provided as a powder and had been prepared by the method of Wilhelmi, *et al.*(7). Assay in the 6-month-old "plateaued" female rat[†] gave 1288 units per gram and in the hypophysectomized immature female rat,[‡] 0.1 mg/day for 10 days produced an average increase in body weight of 16.6 g. It showed no corticotrophic or gonadotrophic activities but did repair the thyroid of the hypophysectomized rat at a total dose of 2.5 mg divided in 4 daily injections. The powder was prepared for injection as previously described except that at the 2 mg and 4 mg/day dose level the concentration of the hormone was increased from 10 mg to 20 mg/ml. The lowest dose of the growth hormone preparation produces a maximal protein anabolic effect in castrated and hypophysectomized rats(4).

Results. The experiments were run in 2 groups (Table I). The 1 mg/day dose was run simultaneously with control-1 and the other two dose levels with control-2. The values of the 2 control groups are presented separately with ranges of the respective values.

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[†] The growth hormone powder was supplied and assayed by Parke, Davis and Co. through the courtesy of Drs. D. A. McGinty and L. A. Donaldson.

[‡] These assays were performed by the Institute of Experimental Biology through the courtesy of Dr. C. H. Li.

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TABLE I.
Effect of Anterior Pituitary Growth Hormone on Castrated Male Guinea Pig.

	Guinea pigs No.	Dose, mg/day	Body wt			Temporal muscles, mg	Sem. ves. + pros., mg	M/A,* mg/mg	Adrenals, mg	Thyroid, mg
			Initial, g	Change, g						
Control 1	7		508	+62 (35-101)		693 (566-729)	552 (395-644)			
" 2	7		570	+45 (15-88)		686 (603-712)	547 (499-697)		264	121
Growth Hormone	7	1	543	+30		730	606	.71	241	118
" "	4	4	586	+39		817	743	.66	313	131
" "	4	4	586	+39		818	684	.95	288	141

* M/A (myotrophic-androgenic ratio) is the growth of the temporal muscles divided by the growth of the seminal vesicles and prostates.

Body weight. The growth hormone at the various dose levels did not significantly increase the rate of growth over that already present.

Myotrophic Property. A small increase in muscle size was produced by the growth hormone at 1 mg/day. The increase was significantly enhanced by doubling the dose but no further increase was obtained on a four-fold increase of the dosage.

Androgenic Property. The seminal vesicles and prostates increased in parallel with the temporal muscles.

Adrenals and Thyroid. The changes in these organs were equivocal.

Discussion. The failure to note a change in the body weight of the guinea pigs injected with growth hormone is not too unexpected. The effect of the growth hormone on body weight also is not readily apparent in growing rats especially males(8). The effect of the androgens, too, is apparent in the excised muscles before it is on the total body (2, also unpublished). The small effect on the prostate and seminal vesicles of the growth hormone preparation probably is not a true androgenic response but part of the general effect of growth hormone on all tissues. On the other hand, it is possible that trace impurities in the growth hormone preparation stimulated the production of "Albright's N-Hormone"(9) from the adrenal cortex to bring about the parallel effect on the muscle and the accessory sex organs.

The effect produced by the growth hormone at 2 and 4 mg/day is comparable to those produced by testosterone in oil solution at 0.5 mg/day but less than at 0.1 mg/day in crystalline suspension (unpublished, cf 2).

Summary. An anterior pituitary growth hormone preparation containing some thyrotrophic hormone produced a small increase in size of the temporal muscle of the castrated male guinea pig accompanied by a parallel increase in the accessory sex organs.

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