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Effect of Amytal upon Pilocarpine-Induced Submaxillary and Gastric Secretion.*

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The only note on the action of amytal upon the secretory response of the submaxillary gland to pilocarpine is that of Stavraký,¹ who observed that even after doses of amytal large enough to abolish the effects of stimulation of the chorda tympani and injections of acetyl choline the submaxillary gland still secreted vigorously in response to injections of pilocarpine.

My experiments deal with both the immediate and delayed effects of amytal upon the secretion of submaxillary saliva and of gastric juice induced by pilocarpine. Three dogs having permanent submaxillary fistulae were used. Observations were made upon 2 normally innervated glands (Dogs 22 and 457) and upon 2 glands after the chorda tympani nerves had been cut at the point where they separated from the lingual nerves (Dogs 22 and 205). One of the dogs also had a denervated gastric pouch which included the mid-portion of the greater curvature.

The pilocarpine (0.2, 0.4 and infrequently 0.6 mg. per kg.) was given intravenously to eliminate the factor of irregular absorption. With rare exceptions pilocarpine was not injected more frequently than once every 24 hours. Secretion began within 20 seconds after the injection. Collections were made every 5 minutes from the appearance of the first drop to the practical cessation of the secretion. Under these conditions the quantity of saliva secreted by individual animals on successive days followed curves of fairly constant form, height and duration, and there appeared to be no change in the sensitivity of the animals to pilocarpine after repeated injections. When the normal influence of pilocarpine upon the gland had been determined, amytal was administered either orally or intravenously as the sodium salt in doses of from 5 to 65 mg. per kg. Immediately after a 45 mg. per kg. dose there was little if any change in the character or duration of the effect of pilocarpine. However, at 6 hours, when the animal had not entirely recovered consciousness,

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¹ Stavraký, G. W., *J. Pharm. and Exp. Therap.*, 1931, **43**, 499.

TABLE I.
Summary of Experimental Results.

Dog	Structure	Dose mg. per kg.		Duration of Pilocarpine —Response in Min.—	Return to Normal Days
		Pilocarpine I.V.	Na Amytal I.V.	2nd day after amytal	
22	Normal submaxillary	.4	45	115-130	11
	Submaxillary—Chorda tympani cut 6 days before	.4	40	115	6
	Submaxillary—Chorda tympani cut 12 days before	.4		115	
	Normal submaxillary	.6	45	160	13
	"	.6	55	160	13
457	"	.2	65	155-170	9
	"	.2	45	100	8
	"	.2	10	110	6
	"	.2	5	105	
	"	.2	20	95	
205	Submaxillary—Chorda tympani cut 19 days before	.2		90	More than 6
	Denervated gastric pouch	.2		80	More than 6
		.2		85-90	

pilocarpine stimulated a definitely smaller flow of saliva although the reaction was normal in duration. At 18 hours, while the dog was still slightly ataxic, the secretory response to pilocarpine was still depressed and moreover was strikingly shortened. From this time on there was a progressive diminution in the duration of secretion to a minimum on the second to third day. At the same time the secretory response of the gland in the first 5 minutes after the injection of pilocarpine was normal or even greater than the control. After the third day there was a gradual return toward the normal duration, but in this experiment the recovery was not yet complete on the ninth day after the injection of the amytal.

Protocol: Dog 457; wt. 11.6 kg.; right submaxillary fistula.

Dose of pilocarpine 0.2 mg. per kg.

Control: Secretion in first 5 min. 5.06 cc. Duration of the effect of pilocarpine 85 minutes. Total quantity of saliva produced 23.45 cc.

On the following day the dog received 45 mg. per kg. of sodium amytal intravenously.

6 hrs. after giving sodium amytal: Dog has not entirely recovered from the anesthesia. Secretion in first 5 min. 2.82 cc. Duration of secretion 85 minutes. Total quantity of saliva 15.94 cc.

At 18 hrs.: Dog slightly ataxic. Secretion in first 5 min. 3.33 cc. Duration 60 min. Total quantity 10.58 cc.

At 25 hrs.: Dog fully recovered. Secretion in first 5 min. 4.82 cc. Duration 40 min. Total quantity 9.99 cc.

At 44 hrs.: Secretion in first 5 min. 5.30 cc. Duration 40 min. Total quantity 9.01 cc.

At 66 hrs.: Secretion in first 5 min. 5.30 cc. Duration 40 min. Total quantity 11.94 cc.

6th day: Secretion in first 5 min. 6.54 cc. Duration 70 min. Total quantity 16.46 cc.

9th day: Secretion in first 5 min. 5.84 cc. Duration 75 min. Total quantity 15.94 cc.

The effect described is independent of the influence of the parasympathetic centers since it occurred to the same degree before and after the chorda tympani had been cut and since it also was observed in the case of a denervated gastric pouch. Neither is the effect one of simple dehydration, for although the withdrawal of water for 48 hours diminished the amount of saliva produced by Dog 22 in response to injections of pilocarpine, this change was a simple diminution in volume without shortening of the duration of the response.

Table I gives a summary of the experiments showing the doses of pilocarpine and amytal used, the degree of shortening of the secretory effect of pilocarpine and the time required for return to normal. It will be noted that amytal administered by either the oral or intra-

venous route is effective and that all doses above 10 mg. per kg. produce a delayed shortening of the effect of pilocarpine on the second day. The amount of shortening and particularly the duration of the recovery period are related to the dose but are not definitely proportional to it.

Doses of 5 mg. per kg. of amytal by mouth did not significantly alter the response of the denervated salivary gland of Dog 22 to pilocarpine. However, when this same dose was repeated on 4 successive days a very definite shortening of the duration of the effect of pilocarpine was evident on the fifth day. This result taken in conjunction with the long duration of the recovery period after large doses of amytal indicates that sodium amytal or its decomposition products may remain in the tissues for a considerable length of time.

8065 P

A New Tick Vector of Relapsing Fever in California.

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Relapsing fever has been repeatedly reported in California since 1921 (Briggs,¹ Porter, Beck and Stevens,² and Coleman³). While ticks have been suspected as vectors for some time (Herms and Wheeler,⁴ and Coleman⁵), no positive experimental evidence incriminating a particular species has been obtained until recently.

A careful search for ticks has been made repeatedly in various localities in California where cases of relapsing fever had been reported. On August 12, 1931, three specimens of mature *Ornithodoros* ticks were taken in a cottage located at Brockway, Lake Tahoe, California, at an elevation of approximately 6,000 feet, where cases of this disease had occurred about a month previously.

¹ Briggs, *J. Am. Med. Assoc.*, 1922, **79**, 941.

² Porter, Beck, and Stevens, *Am. J. Public Health*, 1932, **22**, 1136.

³ Coleman, *J. Infect. Dis.*, 1933, **53**, 337; and 1934, **54**, 11.

⁴ Herms and Wheeler, paper presented at a joint meeting of Section N (Medical Sciences), A.A.A.S., and the American Society of Parasitologists, June 20, 1934, in Berkeley, Calif. Manuscript.

⁵ Coleman, *J. Infect. Dis.*, 1934, **54**, 281.