PHARMACOLOGY

RESEARCHES ON SWEAT FORMATION BY THE ACTION OF PILOCARPINE* AND ACETYLCHOLINE UPON FILATOV MULTIPLE STEP GRAFTS

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Contrary to the experimental findings reported by Langley and Anderson, clinical observations have shown that denervated sweat glands are incapable of responding to pilocarpine. In cases, e. g., of the severance of a spinal nerve in the analgesic area, sweat responses can no longer be obtained by central stimulation or in response to pilocarpine [5, 6, 8]. Similar results are obtained after extracranial section of branches of the trigeminal nerve [4, 8]. A skin graft preserves in the first several days after transfer a weakened "pilocarpine type" sweating which subsequently vanishes; when the graft acquires sensitivity, sweating capacity is restored – both in response to central stimulation and to pilocarpine [3, 9]. Langley and Anderson [7], experimenting with cats, severed the sciatic nerve and observed the pilocarpine effect during the period of degeneration of the peripheral segment. It appeared that sweating was maintained on the operated side, even though diminished. To explain the hidrosis the authors postulated that in the denervated paw there was no stimulus to blood flow due to muscle contractions, which diminished the circulation as compared with the unoperated side. However, Foerster [5] showed that in the anhidrotic area pilocarpine dilated the blood vessels less than in the symmetrically intact zone.

The contrary views of pharmacologists and clinicians on the mechanism of pilocarpine action, which first arose almost a half century ago, have still not been resolved since the clinicians appear to have as good material as their opponents.

In former experiments the clinicians used pilocarpine as subcutaneous injections. In order to avoid toxicity, the doses were not in excess of 0.01-0.015 g, and therefore, the diluted solution entering the general circulation would eventually reach the sweat glands in insignificant concentration. As we have shown previously [1, 2], in order to explore local sweat reactions of the skin to one or another substance there is no need for subcutaneous injections. Instead it is possible to utilize the intradermal method of Minor; the skin area to be observed is painted with iodine solution, being injected after it has dried. Then the area being observed is dusted with starch. In case of a positive sweating response around the intradermally injected site, black dots appear. These are scant with poor secretion of sweat, while with more copious secretion they are correspondingly more numerous; sometimes they will coalesce into one black blotch.

The suggested technique permits the complete exclusion of the blood vessel factor, and the introduction into the region of the sweat glands of experimental solutions in relatively high concentrations; it also excludes generalized effects of the chemicals being tested. These advantages of the intradermal method enabled us to study the sweat-producing effects of acetylcholine upon denervated skin.

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Sweating Reaction to Acetylcholine and Pilocarpine of Filatov Skin Grafts

Patient	Location of graph	Time existence of graph	acetylcholine			pilocarpine			Control sweating response to healthy skin to acetyl-choline and pilocarpine
			Place of injection on graph	Sensitivity of graph	Sweating response	Place of injection on graph	Sensitivity of graph	Sweating response	
D–k	anterior part of chest-wrist	4 wk.	peripheral portion	—	—	peripheral portion	—	—	+++
same	Same	6 wk.	proximal end	±	+	Not done			+++
B–a	abdominal wall-wrist	4 wk.	peripheral portion	—	—	Same			+++
N–k	abdominal wall-arm	3 wk.	Same	—	—	Same			+++
same	Same	7 wk.	proximal end	+	+	Same			+++
same	arm to cheek	10 days	peripheral portion	—	—	Same			+++
N–a	shoulder-nose	4 wk.	mid portion	—	—	Same			+++
S–a	shoulder	2 wk.	mid portion	—	—	mid portion	—	—	+++
T–v	abdominal wall-forearm	5 wek.	proximal end	+	+	Not done			+++
same	Same	8 wk.	Same	++	+++	Proximal end	++	++	+++
same	Same	8 wk.	peripheral end	—	—	Not done			++
T–v	nose after construction	9 mo.	tip	++	+	Same			+++
V–v	abdominal wall-wrist	3 wk.	peripheral portion	—	—	proximal end	—	—	++
K–v	shoulder-nose	3 wk.	proximal end	—	—	Same	—	—	+++
P–v	abdominal wall-wrist	6 wk.	peripheral portion	—	—	Same	—	—	++
same	nose after construction	6 mo.	wing	++	++	Not done			+++
E–a	Same	3 mo.	tip	++	++	Same			+++
Kh–a	fore-arm	20 years	mid portion	++	+	peripheral portion	++	++	++

EXPLANATION OF SIGNS:

Sensitivity of graft:

Absent	—
Doubtfull	±
Weak	+
Pronounced	++

Sweating reaction:

Absent	—
Few black dots	+
Numerous black dots	++
Coalesced patch	+++

The pilocarpine and acetylcholine effects on Filatov multiple-step skin graft surfaces were studied by us at the Maxillofacial Clinic of Surgery and Stomatology of the 1st Leningrad Medical Institute (Supt. Prof. A. A. Kyandsky). There were altogether 11 patients in the process of receiving Filatov grafts (Surgeon-Candidate in Medical Sciences L. R. Balon). Pilocarpine and acetylcholine were used in 1 : 1000 solutions. Injections were repeated at intervals of several days. Each time the intradermal injections into the grafts were 0.1 ml. Altogether there were 25 observations, of which 18 were with acetylcholine, and 7 with pilocarpine. The results are presented in the table. From this table it is evident that in all cases of absence of sensation in the graft, both with acetylcholine and pilocarpine, the sweating reaction was also absent and, conversely, with the restoration of sensation the sweating reaction was restored (see photograph). In most instances, it was possible to

Patient T receiving simultaneous injections of acetylcholine in the sensitive (root) portion of the graft and the insensitive (peripheral) end of the graft. In the first instance – the sweat-producing reaction is markedly positive (the innumerable black dots have coalesced into one large spot); in the second – a negative reaction (dark spot corresponds to site of injection).

establish a direct relation between the amount of sensitivity and the sweating reaction.

Denervated sweat glands are incapable of responding to either pilocarpine or acetylcholine.

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