Chapter - 5

IN VITRO CHARACTERIZATION OF ADRENERGIC RECEPTORS MEDIATING EXTRUSION OF PREFORMED SEBUM FROM PREPUTIAL GLAND OF RAT

There is neurohistochemical evidence that the preputial gland, a sebaceous analogue, of rat is supplied by adrenergic as well as cholinergic nerves (Chapter-4). It is not definitely known to what extent the sebaceous gland is under the control of nervous system. Neurohistological studies have yielded no evidence of secretory innervation for sebaceous gland. Serrati (1938) thought that vegetative nervous system regulates sebaceous secretion, basing his conclusion on the observations on patients with various neuronal disorders. Savill (1944) stated that the sebaceous glands of the skin are under the control of autonomic nervous system. Nexmand (1944) observed seborrhea following complete transection of the facial nerve, while Hodgson-Jones and his colleagues (1952) noted no change in sebaceous secretion in denervated area of skin.

Starling (1936) stated that sebum is squeezed out by intradermal injections of epinephrine but Kligman and Shelley (1958) opined that Starling's observations were erroneous since, they could not find any expulsion of preformed sebum after either epinephrine or acetylcholine administration. Present experiment is an attempt at observing the effects of adrenergic agents under *in vitro* conditions, so as to probe deeper into the study of involvement of neurotransmitters in the release of preformed sebum from the preputial glands of rat.

MATERIAL AND METHODS

Wild rats (*Rattus rattus*) were used in the present study. The amount of preformed sebum is greater in wild rats than that in the albino rats. When the amount of preformed sebum is more it is easy to detect its extrusion visually. For this purpose wild rats were selected. The preputial glands were removed and immersed in 20 ml of oxygenated Ringer's solution. After 20 minutes of exposure to Ringer's solution; adrenaline, isoproterenol or phenylephrine were added to Ringer's solution separately at the concentrations

of 1 x 10^{-5} mole/20 ml in each case. Extrusion of the sebum was considered as the positive response. In another set of experiments three different blocking agents viz., propranolol (β-blocking agent), dibenamine and phentolamine (α-blocking agents) at 1 x 10^{-4}mole/20 ml concentration were added. Preputial glands were exposed to blocking agents for 30 minutes. After 30 minutes adrenaline was added and extrusion of secretion that followed was considered as the positive response.

RESULTS AND DISCUSSION

Skin glands of lower vertebrates (anurans) are reported to have α-adrenergic receptor - mediated secretory response (Benson and Hadley, 1969); while cutaneous and hedonic glands of the red-spotted newt are reported to respond to cholinergic stimuli (Hoffman and Dent, 1977; Thomas et al., 1977.) Among the skin glands of mammals, sweat glands are known to be influenced by catecholamines. There are species specific differences in adrenergic receptor sites, for example, β receptor agonists cause sweating in bovids and α-receptor agonists cause sweating in equids (Robertshaw, 1974).

TABLE 1

In vitro response of the preputial gland of rat to adrenergic agonists and antagonists

Experimental group treated with	Response
Adrenaline	+
Phenylephrine	+
Isoproterenol	-
Dibenamine+ Adrenaline	-
Phentolamine+Adrenaline	-
Propranolol+Adrenaline	+

+ sign in the column of response indicates positive response to the drug whereas - sign indicates negative response.

Table 1 shows the pattern of responses of preputial glands to various drugs employed in the present study. Addition of adrenaline or phenylephrine caused quick extrusion of secretion from the duct and the response was apparent over a considerable period of time. Isoproterenol addition did not elicit a positive response. Thus, it is clear that the extrusion of preformed sebum from the preputial glands of rats is regulated by α-adrenergic receptor influence.

To confirm the possibility of α-receptor mediating action of adrenergic agonists, after 30 minutes of preincubation with blocking agents, adrenaline was added in each case. The glands preincubated with α-receptor blocking agents (either dibenamine or phentolamine) did not respond while those preincubated with β - receptor blocking agent (propranolol) still showed a positive response to addition of adrenaline. This suggests that α-blocking agents are effective in blocking the response of the glands to adrenaline while β-blocking agents are without such effect. This can be said to confirm the contention that extrusion of sebum from the preputial gland of rat is mediated through α-adrenergic receptors.