Influence of Neurotransmitter on Human Meibomian Gland Epithelial Cells

Researchers at Schepens Eye Research Institute hypothesized that neurotransmitters are released in the vicinity of the human meibomian gland; act upon glandular receptors; and influence the production, secretion and/or delivery of meibomian gland secretions to the ocular surface. Their goal in this study was to begin to determine whether neurotransmitters do influence the meibomian gland.

They examined immortalized human meibomian gland epithelial (SLHMG) cells for the presence of vasoactive intestinal peptide (VIP) and muscarinic acetylcholine (mACh) receptor transcripts and proteins. The researchers also exposed cells to VIP, carbachol, forskolin and/or 3-isobutyl-1-methylxanthine (IBMX) to determine whether these agents, alone or in combination, modulate the adenylyl cyclase pathway, the accumulation of intracellular free calcium ($[Ca^{2+}]i$), or cell proliferation.

Their results demonstrate that: [a] SLHMG cells transcribe and translate VIP and mACh receptors; [b] VIP, with either IBMX or forskolin, activates the adenylyl cyclase pathway; the effect of VIP and forskolin together is synergistic; [c] both VIP and carbachol increase intracellular $[Ca^{2+}]$ in SLHMG cells; and [d] VIP with forskolin stimulates SLHMG cell proliferation.

In conclusion, this study shows that parasympathetic neurotransmitters and their agonists influence the function of human meibomian gland epithelial cells. It remains to be determined whether this action alters the production, secretion and/or delivery of meibum to the ocular surface.

SOURCE: Kam WR, Sullivan DA. Neurotransmitter influence on human meibomian gland epitheilial cells. Invest Ophthalmol Vis Sci. 2011;Oct 3 [Epub ahead of print].