

## **Inhibition of Tyramine Signaling by cGMP in *Drosophila melanogaster* Malpighian Tubules**

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The Malpighian tubule serves as the kidney for *Drosophila melanogaster*, so its responsibility is to transport fluid from the hemolymph to the tubule lumen to create urine. The tubule epithelium consists of principal cells, which are responsible for active cation ( $K^+$ ,  $Na^+$ ) transport, and the stellate cells, which are responsible for passive anion ( $Cl^-$ ) transport. The transport creates a voltage difference, or a trans-epithelial potential (TEP), between the hemolymph and the lumen. Tyramine (TA) is synthesized from tyrosine by tyrosine decarboxylase in the principal cells, and it enhances stellate chloride conductance. I tested the hypothesis that cGMP affects some part of the TA signaling pathway in the stellate cells. 1mM cGMP significantly suppressed the response to both 100nM TA (significant difference in response before vs. after cGMP exposure;  $p=0.0074$ , paired t-test;  $n=6$  tubules) and 10nM TA (significant difference in response before vs. after cGMP exposure;  $p<0.0001$ , paired t-test;  $n=8$  tubules) in normal saline. In addition, I observed a trend for suppression of TA-triggered oscillations in standard bathing medium, a substance that mimics *Drosophila* hemolymph. The data were made more complex by the significantly hyperpolarized TEP in 1mM cGMP, which reflects the previously-discovered fact that cGMP enhances principal cell cation transport. In conclusion, cGMP application resulted in both the suppression of the TA-triggered response and the hyperpolarization of the TEP. This reaffirms the known enhancement by cGMP of active cation transport in the principal cells, and it reveals the presence of some mechanism for cGMP-triggered inhibition of the TA pathway in the stellate cells.