

The Chemical Structure of Blepharismine, The Photosensor Pigment for *Blepharisma japonicum*

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Abstract

Blepharisma japonicum, a motile unicellular ciliate, is capable of both light intensity- and color (wavelength)-sensory perception. This primitive photosensing apparatus represents a unique "visual sensory system" based on blepharismine as the photodetector molecule. We report here the chemical structure of the photosensor molecule, the major component of blepharismine, which is a derivative of hypericin, a powerful photodynamic sensitizer in nature. Blepharismine is also a member of the ciliate photosensory pigments that include stentorin, from *Stentor coeruleus*, whose structure we have recently elucidated (N. Tao et al., J. Am. Chem. Soc. 115: 2526-2528, 1993). Our preliminary data had suggested that the blepharismine chromophore was similar, but not identical to the stentorin chromophore. We show in this report that blepharismine possesses a unique structure neither present in the parent molecule, hypericin, nor in the relative one, stentorin. The chemical structure of blepharismine has been deduced by mass spectrometry, NMR and FTIR spectroscopic methods. Data are consistent with the structure, 2,4,5,7,2',4',5',7'-octahydroxy-6,6'-diisopropyl-1,1'-*p*-hydroxybenzylidene naphthodianthrone, (C₄₁H₃₀O₁₁), as shown below:

