

# Distribution of Palisade Endings Across Species Suggests They Function in Vergence Eye Movement Control

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Mammalian extraocular muscles (EOMs) are remarkably different from “regular” skeletal muscles in structure and sensory innervation. In addition to classical twitch-type fibers, they contain amphibian-like tonic fibers that are connected to putative sensory receptors only found in EOMs, the palisade endings (PEs). In trying to understand the function of these and other eye muscle proprioceptors (see Leigh and Zee<sup>1</sup> for a recent summary), one must also account for their idiosyncratic presence and distribution across species. In this issue, Blumer et al.<sup>2</sup> have produced the first systematic study of PE distribution across 13 mammalian species, both lateral- and frontal-eyed. Using immunofluorescence histological techniques, they provide beautiful images that illustrate the presence, morphology, and distribution of PEs in different rectus EOMs in the species studied. Frontal-eyed species (human, monkey, cat, ferret) have many more PEs in the medial rectus muscles, compared with the nine lateral-eyed animals studied (from the largest [horse] to the smallest [mouse]). The authors speculate that this preponderance of PEs in the medial rectus implicates the monitoring of convergence eye movements as a prime function. Consistent with this hypothesis is a behavioral study of Niechwiej-Szwedo et al.<sup>3</sup> that showed a proprioceptive link with convergence state. The Blumer et al.<sup>2</sup> study should provoke many more studies linking structure with the functions of EOM proprioception.

## References

1. Leigh RJ, Zee DS. *The Neurology of Eye Movements*. 5th ed. New York: Oxford; 2015:40–42.
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3. Niechwiej-Szwedo E, González EG, Bega S, Verrier MC, Wong AM, Steinbach MJ. Proprioceptive role for palisade endings in extraocular muscles: evidence from the Jendrassik maneuver. *Vision Res*. 2006;46:2268–2279.