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REGULAR ARTICLE

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Morphological analysis of CD15-immunoreactive neurons in the guinea pig retina

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Abstract Using immunocytochemistry, morphometry and electron microscopy, we have investigated the distribution and characteristics of CD15-immunoreactive (IR) neurons in the guinea pig retina. In the present study, two types of amacrine cells, including interplexiform cells in the inner nuclear layer (INL) and some cells in the ganglion cell layer (GCL), were labeled with anti-CD15 antisera. Type 1 amacrine cells had large somata located in the INL, with long and branched processes ramifying mainly in strata 4 and 5 of the inner plexiform layer (IPL). Somata of type 2 cells had smaller diameters, and were also located in the INL. Their processes stratified in stratum 1. The densities of type 1 and type 2 amacrine cells increased from 152.8±36.7/mm^2 and 160.6±61.7/mm^2 in the peripheral retina, to 404.3±41.5/mm^2 and 552.2±72.2/mm^2 in the central retina, respectively. Cells in the GCL exhibiting CD15 immunoreactivity were rarely observed. Colocalization experiments, using consecutive semi-thin sections, demonstrated that these CD15-IR amacrine cells exhibited γ-aminobutyric acid (GABA) immunoreactivity. In addition, the processes of the type 1 cells formed one member of the postsynaptic dyads that are formed in the axon terminals of rod bipolar cells. Most of these processes made reciprocal synapses back to the axon terminals of the rod bipolar cells. Thus, CD15-IR amacrine cells constitute a subpopulation of GABAergic amacrine cells in the guinea pig retina, and the type 1 cells among them provide the inhibitory input to rod bipolar cells.

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Introduction

Amacrine cells constitute the most diverse group of cell types within the retina with respect to morphology, size, and retinal coverage. They appear to make up ~40% of all the neurons of the inner nuclear layer (INL). Amacrine cells are variegated in both shape and biochemistry (Wässle and Boycott 1991; MacNeil and Masland 1998), and have equally diverse functions (Masland 1988; Vaney 1990). The functions of only three types are understood in any detail: AII, starburst, and A17 amacrine cells (Masland 1988; Vaney 1990; Wässle and Boycott 1991). The large majority of amacrine cells in mammalian retinas remain uncharacterized.

CD15, the CD cluster designation for the epitope represented by 3[α1-3]-fucosyl-*N*-acetyl-lactosamine, is a glycoconjugate. Immunohistochemical studies have revealed a widespread distribution of CD15 in various nonneuronal tissues such as epithelial cells of the digestive and urinary tract, skin appendages, and myeloid cells (Fox et al. 1983; Howie et al. 1984; Kerr and McCarthy 1985; Itzkowitz et al. 1986). In the adult central nervous system (CNS) of various species, CD15 has been detected by immunocytochemistry in glial cells and certain neuronal cells (Niedieck and Löhler 1987; Mai and Reifenberger 1988; Gocht and Löhler 1993; Gocht et al. 1994). The epitope has been reported to be involved in cellular adhesion by means of homophilic reactions (Bird and Kimber 1984; Fenderson et al. 1984, 1990) and heterophilic reactions with selectin (Brandley et al. 1990; Springer and Laskey 1991; Kerr and Stocks 1992), in the differentiation of dendrites and in synapse formation (Mai and Schoenlau 1992; Schoenlau and Mai 1995; Mai et al. 1999).

Recently, Andressen and Mai (1997) have investigated the distribution of the CD15 epitope in the retinas of several vertebrate species. Their comparative study