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Calretinin-, Neurocalcin-, and Parvalbumin-Immunoreactive Elements in the Olfactory Bulb of the Hedgehog (*Erinaceus europaeus*)

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ABSTRACT

The distribution pattern and morphology of calretinin-, neurocalcin-, and parvalbumin-immunoreactive neurons were studied in the main and accessory olfactory bulbs of the hedgehog. The detection of these markers was carried out by using monoclonal or polyclonal antibodies and the avidin-biotin-immunoperoxidase method. Specific neuronal populations were positive for these calcium-binding proteins in the hedgehog olfactory bulb, revealing both similarities to and differences from the data reported in the olfactory bulb of rodent species. The distribution pattern of each calcium-binding protein studied in the accessory olfactory bulb was highly similar to that described in other macrosmatic species. However, in the main olfactory bulb, the markers analyzed were expressed in similar interneuronal populations as they are in the rodent olfactory bulb, whereas cell groups categorized as projecting neurons demonstrated striking differences in the expression of these calcium-binding proteins. These results suggest that the expression of calcium-binding proteins in a given brain region is not a constant feature among species despite a similar organization but that different factors could influence their expression. Thus, the accessory olfactory system involved in the processing of specific and similar olfactory cues among species demonstrates a more constant organization among species. By contrast, the functionally important role of the main olfactory system in the hedgehog is accompanied by a more complex organization, which is reflected in an increased diversity of calcium-buffering systems. J. Comp. Neurol. 429:554–570, 2001.

Indexing terms: calcium-binding proteins; immunohistochemistry; insectivorous; olfaction; specific cell markers

Calretinin (CR), neurocalcin (NC), and parvalbumin (PV) are members of the EF-hand homolog family, a group of calcium-binding proteins (CaBPs) that, among others, includes calbindin D-28k, troponin C, and S-100 proteins (Kretsinger et al., 1991). These CaBPs bind intracellular free calcium in a micromolar range, which suggests either that they have physiologically important storage and buffering properties or that they mediate intracellular calcium fluxes, being actively involved in calcium-mediated signal transduction (Rogers and Résibois, 1992; Ikura, 1996). In fact, the expression of different CaBPs in neurons seems to highlight distinct functional compartments of sensory pathways (Celio, 1990; Andressen et al., 1993), and although the specific physiological tasks of each CaBP remain uncertain, their ability to mediate calcium signals prompted the proposal of their involvement in the control of neuronal activity (Celio, 1990; Andressen et al., 1993).

In the olfactory bulb (OB), CaBPs are expressed in large amounts and have been detected in segregated neuronal populations, allowing the distinction of several neurochemical groups within morphologically homogeneous

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