

ELECTRICAL PROPERTIES OF PERIGLOMERULAR CELLS IN THE FROG OLFATORY BULB

P.C. MAGHERINI, R. BARDONI AND O. BELLUZZI

Dipartimento di Scienze Biomediche, Sezione di Fisiologia, Via Campi 287, 41100 Modena, Italy

INTRODUCTION

The inhibitory interneurons of the olfactory bulb (OB) play an important role in the signal processing of sensory input. The periglomerular cells (PG) and the granule cells, located at the input and output of the bulb, respectively, are interneurons mediating the horizontal flow of information, in an arrangement closely resembling that of the horizontal and amacrine cells in the retina (6). In the OB, however, the role of interneurons is not understood so well, especially for the PG cells, the object of this study. Understanding the basic properties of these cells holds the key for understanding synaptic interactions in the olfactory bulb and, in particular, for the comprehension of signal processing taking place at the synaptic triad between olfactory nerve (ON), mitral/tufted (M/T) cells and PG cells (12, 13).

To date only a few reports are available on intracellular activity in identified PG cells (4, 18), and these diverge even in the description of such basic features as the presence or absence of voltage-dependent Na⁺-channels and the consequent capability of spiking or lack thereof. These uncertainties about their properties are most likely due to the small size (6-8 μm) of the PG cells, among the smallest in the brain (5). The difficulties in accessing these cells can now be overcome by applying the technique of patch-clamp recordings in thin slices (8), which makes it possible to access visually identified adult neurons retaining their functional cytoarchitecture. Furthermore, the small size of these cells becomes an advantage for whole-cell recordings since good voltage control is possible.

In the present study the slice technique was applied in combination with whole-cell patch-clamp recordings in the frog olfactory bulb. We describe the membrane properties of intact PG cells and the kinetics and pharmacological properties of the main voltage-dependent currents, i.e. I_{Na}, I_{Ca} and I_A. We believe that the present study, extending the knowledge on interneurone membrane properties, is a necessary prerequisite for studies on synaptic transmission in the olfactory bulb.

METHODS

After anaesthesia with MS222 (Sigma), adult frogs (*Rana esculenta*, 40-60g) were decapitated and pithed. The head, pinned onto a Petri dish, was submerged in chilled Ringer solution and the skull was then opened using a ventral approach. The OB was pasted to the stage of a vibroslicer (Campden) with cyanoacrylate glue, and sliced on a coronal plane at a thickness of

