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NICOTINAMIDE-ADENINE-DINUCLEOTIDE-PHOSPHATE DIAPHORASE-POSITIVE NEURONS AND FIBERS IN THE NUCLEUS OLFACTORIUS ANTERIOR OF THE RAT

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INTRODUCTION

The nucleus olfactorius anterior (NOA) is located in the olfactory peduncle, just behind the olfactory bulb. This structure was considered an undifferentiated gray substance until Herrick (11) described it with detail in the opossum. Actually, its main role in the processing of the olfactory information is well known. The NOA is widely connected with the olfactory bulb through an extensive system of longitudinal fibers, and with other olfactory-related brain structures, such as the piriform cortex, the taenia tecta, the entorhinal cortex, the amygdaloid nuclei, the horizontal and vertical limbs of the diagonal band of Broca, the endopiriform nuclei, the bed nucleus of the stria terminalis and the tuberomammillary hypothalamus (21). The rat NOA receives the olfactory information from both olfactory bulbs and sends it to the ipsi- and contralateral olfactory brain centers, allowing that similar sensory information to arrive to both hemispheres (7, 17, 18, 23, 25, 26).

The nicotinamide adenine dinucleotide phosphate (NADPH) diaphorase is an oxidative enzyme that can be detected histochemically using a water-soluble tetrazolium salt which is transformed into an insoluble formazan reaction product (15, 22). The enzyme NADPH-diaphorase is a selective histochemical marker for distinct neuronal populations in the peripheral and central nervous systems. The neurons displaying NADPH-diaphorase activity are stained in a «Golgi-like» appearance, enabling a detailed morphologic characterization of the positive cells.

Recently, the NADPH-diaphorase has been identified as a nitric oxide synthase (13) that converts L-arginine to citrulline and nitric oxide in a NADPH-diaphorase-dependent reaction. Nitric oxide is a neuronal messenger molecule which seems to be involved in long-term potentiation and retrograde transmission (3, 24).

NADPH-diaphorase activity has been studied in several brain regions including the NOA of cat, hamster and rat (5, 19). However, this information is currently limited to a brief description in more general studies, and a detailed description of the distribution and morphological characteristics of the positive elements in the different NOA subdivisions and transition areas is still lacking.