Characterization of Afferent Pathways to the Hypothalamic Aggression Area in the Rat.

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Aggressive attack behavior can be elicited by electrical stimulation of the hypothalamic attack area (HAA) which is located in the intermediate hypothalamus in the rat. The efferent connections of this area were characterized by Roeling et al in 1994. Many brain areas (e.g. prefrontal cortex, medial amygdala) emerged in the modulation of aggressive responses generated by the HAA. However, the direct afferent pathways to this region in the rat are not clarified to date. The aim of our study was to characterize the direct input of the HAA. The afferent pathways were investigated using iontophoretic injections of cholera toxin B (CTB) in the HAA. CTB positive cells were present in a wide distribution from the prefrontal cortex to the monoaminergic nuclei of the brainstem. The most abundant populations were seen in the medial prefrontal cortex, the lateral septum, the medial part of the bed nucleus of stria terminalis, the medial amygdala, the amygdalohippocampal area, the subiculum and the parabrachial nucleus. CTB positive cells were also present in the dorsal raphe and the locus coeruleus but in a slighter manner. While thalamic nuclei contained only a few labeled neurons (mainly in the posterior part), hypothalamus showed a significant labeling in a quite diffuse distribution from the preoptical area to the mammillary bodies suggesting a functionally significant local circuit. Some brain areas, formerly indicated significant in the control of aggression (e.g. prefrontal cortex, septum, BNST etc.), provide direct input to the HAA. Some other significant regions showed no or sporadic afferentation to the HAA (e.g. orbitofrontal prefrontal cortex, cingulate cortex, central amygdala, dopaminergic nuclei). Later areas probably function as modulatory components of the circuitry. It must be noticed that the distribution of the afferent neurons shows a very wide overlap with the
distribution of efferent fibers of the HAA (Roeling et al, 1994) suggesting strong reverberations in this circuitry.