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Meeting Abstract

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Role of monoamines in the mouse basolateral amygdala in the regulation of fear and anxiety

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Background: The amygdala has been identified as a key player in aversive learning and memory processes. Although our understanding of intra-amygdala connectivity and synaptic plasticity has considerably grown in recent years, the modulatory influence of monoaminergic systems in the amygdala still remains to be fully elucidated. The main catecholaminergic systems, dopamine (DA) and noradrenaline (NA), provide a highly discrete innervation to the functionally distinct subnuclei of the amygdala. While NAergic projections are quite homogenously distributed, DAergic fibres densely innervate GABAergic cell populations (*i.e.* intercalated cells and central amygdala), suggesting a substantial influence of DAergic signaling on amygdaloid information processing and output.

Methods: We stereotactically delivered the neurotoxin 6-hydroxydopamine (6-OHDA) into the basal amygdala (BA) of C57BL6/J mice to selectively lesion midbrain DA neurons innervating the amygdala and associated limbic structures.

Results: Stereological analysis of the two main mesencephalic DA nuclei, the substantia nigra pars compacta (SNc) and ventral tegmental area (VTA), revealed that intra-BA 6-OHDA injections resulted in a significant cell loss in the SNc, questioning the widely accepted fact that the DAergic innervation of the amygdala is mainly derived from the VTA. The DAergic denervation compromised most amygdala substructures (except the central nucleus) as well as the ventral hippocampus, but not the prefrontal cortex. Intra-BA 6-OHDA injections also concomitantly produced a nearly complete loss of noradrenergic terminals in the BA. The loss of monoaminergic signaling in these structures produced an anxiogenic phenotype, but did not affect motor performance and fear learning and memory.

Discussion: Our results bring new light on the role of monoamines in the amygdala on emotional behaviors. Our findings also suggest a substantial participation of mesolimbic SNc neurons in the DAergic innervation and control of amygdala circuits. Further studies will have to clarify the exact origin of DAergic innervation to functionally distinct amygdala subnuclei in order to understand their potential role in anxiety-related behavior.

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