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Prefrontal-midbrain circuits controlling fear behavior

When facing a danger, mammals display a broad range of behavioral fear responses ranging from freezing to flight responses. These responses can be innate or learned and develop rapidly through the recruitment of subcortical structures such as the basolateral amygdala (BLA). It is now clearly established that cortical structures such as the medial prefrontal cortex (mPFC) can precisely control these fear responses, yet our knowledge on the precise neuronal circuits and mechanisms involved is still lacunary. Beside the classical top-down control of BLA activity by the mPFC, recent data collected in my laboratory indicate a key role of a non-canonical pathway between the mPFC and the midbrain, which can control fear responses independently of the BLA. I will present these recent results, which illustrate how different mPFC cell populations projecting to the midbrain control behavioral specificity by regulating fear expression and discrimination.