

Serotonergic activation and antidepressant-like effects

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Numerous studies have suggested that the activation of central serotonergic systems are involved in several emotional/cognitive changes including anxiogenic, antidepressant, and anti-impulsive effects. If each effect is regulated by distinct serotonergic systems, more efficient and safer treatments of depression would become possible at least theoretically. To this end, we examined the effects of selective manipulations of serotonergic activity in each brain region and specific serotonin receptor on emotional/cognitive functions by using recently developed optogenetic tools and serotonin receptor knockout mouse. We used an elevated plus-maze test, a forced swim test, and a 3-choice serial reaction time task to assess anxiety-, antidepressant-like behavior, and impulsive action, respectively. Our results demonstrated that serotonergic activity in the dorsal raphe nucleus has a pivotal role in antidepressant-like effects and anti-impulsive effects, but not anxiogenic effects while that in the median raphe nucleus regulates anti-impulsive and anxiogenic effects, but not antidepressant-like effects. Furthermore, our results suggest that the activation of dorsal raphe nucleus - ventral tegmental area/substantia nigra serotonergic pathway would exert antidepressant-like effects without affecting anxiety or impulsivity.