

The trace amine tyramine is found in spinal ventral horn neurons and induces locomotor-like activity in the isolated neonatal rat spinal cord.

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Trace amines are endogenous amines with pronounced neuromodulatory actions chemically-related to the monoamine transmitters. Recently, a large family of metabotropic trace amine receptors (TARs) have been cloned in human and rodent (Borowsky et al 2001 PNAS; Bunzow et al 2001 Mol. Pharmacol.; Vassilatis et al 2003 PNAS) introducing the likelihood of another major, currently uncharacterized, CNS monoaminergic transmitter system. Interestingly, the TAR1 Gs-coupled receptor is found in spinal cord but only in the ventral horn (Borowsky et al 2001). The trace amines tyramine, tryptamine, and β -phenethylamine are high affinity agonists for rat TAR1 and low affinity agonists of this receptor include dopamine and serotonin.

Here, we used immunolabeling for tyramine in rat lumbar cord to identify putative tyraminer-gic neurons restricted to the deep dorsal and ventral horn. To determine whether tyramine had physiological actions, we used the isolated neonatal rat spinal cord (P0-P3). Bath-applied tyramine (50-100 μ M) was capable of increasing ventral root monitored motor activity. Further, in the presence of NMDA (1-7.5 μ M) tyramine reproducibly induced locomotor-like activity. Similar results were obtained with application of the other trace amines tryptamine and β -phenethylamine. While the non-selective 5-HT receptor antagonist methysergide blocked 5-HT induced locomotion at doses of 1-2 μ M, much higher doses (5-10 μ M) were required to interfere with tyramine-induced locomotion. This suggests that tyramine activates receptor(s) that differ from 5-HT to induce locomotion. These actions are probably via activation of TAR1 receptors.

Overall, in the presence of NMDA, trace amines facilitated the induction of locomotion and helped stabilize the motor rhythm. Moreover, tyramine immunolabeling in a subset of ventral horn neurons introduces the possibility that trace amines have an intrinsic neuromodulatory role in the mammalian locomotor central pattern generator.

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