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Presentation Abstract

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Title: Effects of the trace amines on hindlimb motor output in the neonatal rat spinal cord

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Abstract: The trace amines (**TAs**) are found in the mammalian CNS in low concentrations with uncertain physiological actions. Previously, we demonstrated that the TAs are capable of producing locomotor-like activity (**LLA**) in the isolated neonatal rat spinal cord (Giesecker et al SfN 2004, Gozal et al SfN 2006). In the presence of NMDA, the TAs, tyramine, octopamine, and β -phenylethylamine (**PEA**), produced two different rhythmic motor patterns: a 'steady' LLA pattern and a more complex pattern with transient episodes of LLA interrupted regularly by quiescent periods. To better understand these actions, we examined the effects of the TAs on muscle EMG activity recorded with suction or wire electrodes in the *in vitro* isolated rat spinal cord with intact hindlimbs. Tyramine, octopamine, PEA, or 5-HT were co-applied with NMDA. Rhythmic EMG patterns were observed for each TA. As in our previous studies on ventral root activity, tyramine and octopamine induce either a 'steady' LLA or a more complex pattern with episodes of LLA. The locomotor-like bursts on tibialis anterior (ankle flexor) had a smaller amplitude with tyramine than with 5-HT (n=2). When compared to 5-HT evoked LLA, the amplitude of the bursts recorded for octopamine were smaller during 'steady' LLA (n=2) but larger during the complex episodes of LLA, which also had increased locomotor frequency over 5-HT (n=3). Interestingly, the LLA produced by octopamine converted from a high frequency to a very low frequency pattern with a similar pattern of motor coordination (n=2). We then tested the effects of the TAs on ongoing 5-HT/NMDA LLA. Each TA

modulated the ongoing pattern. When added to the bath, tyramine first stopped LLA, and then reset it to either 'steady' LLA or complex episodes of bursting (n=2). In both cases, the frequency of the bursts was twice as fast as the ongoing 5-HT LLA. Octopamine strengthened ongoing 5-HT LLA by consistently increasing the amplitude of the bursts (n=6). PEA slightly increased the frequency of the ongoing 5-HT LLA (n=2). When 5-HT/NMDA LLA was relatively weak, PEA strengthened it (n=1); when LLA was already strong, there were no major changes (n=1). These observations further support the TAs as neuromodulators that can both activate and modulate spinal locomotor activity (Giesecker et al SfN 2004, Gozal et al SfN 2006, 2007).

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