

Tonic control of inhibitory neurons in the lamprey respiratory central pattern generator through 5-HT_{1A} receptors

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Serotonin (5-HT) has been reported to play excitatory effects on respiration by acting on the respiratory central pattern generator (CPG) in mammals and to be involved in the modulation of the locomotor CPG in lampreys, with an important role of 5-HT_{1A} receptors. No information is available on tonic 5-HT influences on the lamprey paratrigeminal respiratory group (pTRG), the proposed respiratory CPG. To address this issue, experiments were carried out on isolated brainstems of adult lampreys. Bath applications and microinjections into the pTRG of methysergide (a mixed 5-HT₁/5-HT₂ receptor antagonist) and (S)-WAY 100135 (a selective 5-HT_{1A} receptor antagonist) caused apnea within 3-5 min followed by a progressive recovery. On the contrary, ketanserin (a 5-HT₂ receptor antagonist) was ineffective. Microinjections of bicuculline or strychnine, either alone or in combination, into the pTRG prevented the apnea induced by microinjections of (S)-WAY 100135 into the same region. Since GABAergic neurons are not present in this region, an attempt was made to investigate the presence of glycinergic neurons and 5-HT_{1A} receptors within the pTRG region by double-labelling experiments. The presence of 5-HT_{1A} receptors on glycinergic neurons corroborates, at least in part, our neurophysiological findings. The results disclose a potent inhibitory control of lamprey CPG inhibitory neurons exerted via 5-HT_{1A} receptors. Similar control mechanisms appear to be present also in mammals.