B103 - Astrocytes modulate the respiratory network of the lamprey

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AIMS: To investigate astrocyte and ATP functions within the paratrigeminal respiratory group (pTRG), the proposed respiratory central pattern generator of the lamprey.

METHODS: Experiments were performed on isolated brainstems of adult lampreys. The vagal motor output was used to monitor respiratory activity. Bath application and microinjections (30-50 nl) of several drugs were employed. Immunohistochemical labelling of pTRG astrocytes was performed. **RESULTS:** Bath application of the gliotoxin aminoadipic acid (AAA; 1 mM) caused increases in frequency and amplitude of vagal bursts and followed by progressive decreases in both variables. Bilateral microinjections of 1 mM ATP- γ -S into the pTRG caused marked increases in respiratory frequency. These responses were abolished during AAA application, thus indicating that pTRG astrocytes have a crucial respiratory role. Bath application of 5 mM glutamine (Gln) caused a rapid recovery of baseline respiration, thus suggesting that the astrocyte glutamate–glutamine cycle is crucial for the maintenance of the respiratory rhythmic activity. In addition, we ascertained whether ATP and astrocytes contribute to increases in respiratory activity due to reduction in pH of the perfusing solution from 7.4 to 7.0 at constant P_{CO_2} . These increases were still present after bath application of PPADS, a P2R antagonist, but completely abolished after AAA application. However, application of Gln in the presence of AAA restored the low pH-induced responses. **CONCLUSIONS:** The results show that astrocytes are involved in respiratory modulation as well as in ATP- and acidification-induced increases of respiratory activity. The role of astrocytes in rhythmic networks appears to be conserved throughout evolution.