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# Adenosine inhibits the death in immunostimulated murine astrocytes deprived of glucose

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Adenosine has been associated with protection of neurons from noxious stimuli both by receptor- and non receptor-mediated mechanisms. Previously we have reported that immunostimulated astrocytes were highly vulnerable to glucose deprivation. In the present study we investigated the effect of adenosine and related nucleotides on the susceptibility of immunostimulated astrocytes to glucose deprivation. While neither 12-h glucose deprivation nor 2-day treatment with IFN-$\gamma$ and LPS altered the viability of astrocytes, significant death of IFN-$\gamma$/LPS-treated astrocytes was observed after 4-h glucose deprivation. The augmented astrocyte death was blocked by adenosine with an apparent EC50 value of 20 $\mu$M. However, adenosine receptor agonist R-PIA or CHA did not inhibit the augmented cell death. Moreover, adenosine receptor antagonists DPCPX, XAC or DMPX did not alter the augmented death, ruling out the involvement of adenosine receptor in this process. Other purine nucleotides including guanosine, inosine, AMP, ADP and ATP, but not pyrimidine nucleotides such as cytosine, showed similar protective effects. Intracellular ATP level rapidly decreased prior to the release of LDH in immunostimulated astrocytes deprived of glucose. Adenosine and other purine nucleotides inhibited the loss of intracellular ATP. Since high micromolar concentrations of ATP and adenosine nucleotides were released in cerebral hypoxic/ischemic regions, ATP, adenosine and their metabolites may protect the astrocyte death by restoring intracellular ATP level, at least in our experimental systems.