

Sulfite protects neurons from oxidative stress

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Hydrogen sulfide (H_2S) and polysulfides (H_2S_n) are signaling molecules that mediate various physiological responses including cytoprotection. Their oxidized metabolite sulfite (SO_3^{2-}) is found in blood and tissues. However, its physiological role remains unclear. In this study, we investigated the cytoprotective effect of sulfite on neurons exposed to oxidative stress caused by high concentrations of the neurotransmitter glutamate, known as oxytosis.

Free sulfite, present at approximately $2 \mu\text{M}$ in the rat brain, converts cystine to cysteine more efficiently than H_2S and H_2S_n and facilitates transport of cysteine into cells. Physiological concentrations of sulfite protected neurons from oxytosis and were accompanied by increased intracellular concentrations of cysteine and GSH probably due to converting extracellular cystine to cysteine, more efficiently than H_2S and H_2S_n . In contrast, thiosulfate only slightly protected neurons from oxytosis.

Our present data have shown sulfite to be a novel cytoprotective molecule against oxytosis, through maintaining cysteine levels in the extracellular milieu, leading to increased intracellular cysteine and GSH. Since sulfite is more stable than H_2S and H_2S_n , it stays in extracellular environment longer and may continuously supply cysteine into cells. Our results provide a new insight into the therapeutic application of sulfite to neuronal diseases caused by oxidative stress.