

Extracellular cysteine in connexins: Role as redox sensors

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Connexin-based channels comprise hemichannels and gap junction channels. The opening of hemichannels allow for the flux of ions and molecules from the extracellular space into the cell and vice versa. Similarly, the opening of gap junction channels permits the diffusional exchange of ions and molecules between the cytoplasm and contacting cells. The controlled opening of hemichannels has been associated with several physiological cellular processes; thereby unregulated hemichannel activity may induce loss of cellular homeostasis and cell death. Hemichannel activity can be regulated through several mechanisms, such as phosphorylation, divalent cations and changes in membrane potential. Additionally, it was recently postulated that redox molecules could modify hemichannels properties in vitro. However, the molecular mechanism by which redox molecules interact with hemichannels is poorly understood. In this work, we discuss the current knowledge on connexin redox regulation and we propose the hypothesis that extracellular cysteines could be important for sensing changes in redox potential. Future studies on this topic will offer new insight into hemichannel function, thereby expanding the understanding of the contribution of hemichannels to disease progression. © 2016 Retamal, García, Pinto, Pupo, Báez, Stehberg, Del Rio and González.

Connexins

Gap junction channels

Gaseous transmitters

Hemichannels

Post-translational modification

Redox potential

cysteine

gap junction protein

Article

astrocyte

cell survival

channel gating

human

molecular dynamics

oxidation reduction potential

oxidation reduction state

protein determination

protein function

protein localization

protein phosphorylation

retina