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SHORT COMMUNICATION

Is the part of the brain a specialized tissue with regards to redox potential?

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Most of our inner organs are crisscrossed with micro-capillaries blood vessels ensuring oxygenation and supply of nutrients. However, with regards to our brain the situation is different. Although the brain gets lots of oxygen, it is all delivered blood vessels on the surface of the brain and no vessels are actually within the white and gray brain matter. In addition, this organ is surrounded by a barrier that ensures that blood does not enter the tissues. Thus, one has to ask, does the all the brain tissues get enough oxygen for oxygen to be the main electron donor, or does H_2S act as the electron donor in part of the brain?

Two different metabolic states have been proposed for eukaryotic cells; one where oxygen acts as electron donor and one where hydrogen sulfide, at a lower redox-potential, acts as donor. The latter state might underlie hibernation in some animals. However, due the presence of the blood-brain barrier and due to the absence of blood vessels penetrating the brain, it is possible that this second metabolic state is actually the "normal" metabolic state for part of the brain; indeed the difference between white (outer layer) and brown (inner layer) could be that the inner brown matter use H_2S as electron donor.

Is there any evidence to support this, other than the mentioned physiological characteristics? Interestingly, high oxygen levels leads to toxicity effects on the central nervous system ranging from dizziness and inability to concentrate at lower (raised) concentrations of oxygen to twitching, seizures, convulsion, unconsciousness and death at higher concentrations. Thus, the brain function is hypersensitive to raised oxygen levels compared to most of the body's tissues and organs.

Other organs that are mainly damaged at high oxygen concentrations are the eyes and lungs; organs where this secondary H_2S dependent metabolic state also might be important. In case of the lungs as oxygen-depleted blood normally is pumped through part of thisorgan as part of the oxygenation process.

Thus, understanding the metabolic states of the different brain tissues could be crucial for unraveling the function of the centers of the central nervous system.

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