

Therapeutic Potential of Molecular Hydrogen (H₂) via Reactive Oxygen Species (ROS).

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Introduction.

Formation of ROS is strongly related to the emergence of several human pathologic conditions such as atherosclerosis, neurodegenerative diseases, and aging as well as certain types of human cancers including lung, breast, and colon. ROS are generated in organisms by γ , X, and UV radiation, biotransformation of dietary chemicals, some diet components, for example, transient metal ions and inflammatory reactions during normal cellular metabolism ⁽¹⁾.

Method.

Clinical and pre-clinical studies have reported a broad range of applications for molecular Hydrogen.

H₂ can permeate into bio membranes, cytosol, mitochondria and nuclei and can be dissolved in water.

H₂ reduces oxidants of the detrimental ROS including hydroxyl radicals (OH⁻) and peroxynitrite (ONOO⁻), which serve a causative role in the promotion of tumor cell proliferation, invasion and in particular situations metastasis but do not disturb metabolic oxidation-reduction reactions in cell signalling.

Results.

H₂ selectively quenches detrimental ROS and it has become an interesting molecule due to its anti-apoptotic, anti-inflammatory, antioxidant and anti-allergy effects.

Cancer is a multi-stage process defined by initiation, promotion and progression.

ROS can increase tumor cell proliferation, survival and cellular migration in animal models and humans by inducing cellular signal transduction pathways.

Tumor cells generate ROS more abundantly than normal cells and cause elevated oxidative stress.

Oxidative stress is an imbalance in the body where harmful uncharged oxygen atoms (free radicals) are not being efficiently neutralised by antioxidants.

This is known to contribute to cancer development.

H₂ is a powerful antioxidant and can counteract free radicals and therefore help in the fight against cancer.

Conclusion.

Damage to DNA by ROS is involved in chronic inflammatory diseases and in a wide variety of cancer types, including bladder cancer brain tumors and breast cancer.

Reference.

1- Tudek B., et al. Involvement of oxidatively damaged DNA and repair in cancer development and aging.

American J. of Translational Research 2010;2(3):254-284