

REACTIVE OXYGEN SPECIES (ROS), OXIDATIVE STRESS AND CANCER FACT SHEET

What are reactive oxygen species (ROS)?

- Every human cell contains molecules called ROS, usually as byproducts of a normal function that powers the cell.¹
- ROS can promote cell growth and can also sometimes induce cell death.²
- Healthy cells maintain a balance between ROS production and ROS elimination and keep ROS levels low to prevent cellular damage.³

What happens when a cell can't control its ROS balance?

- Cells that cannot control their ROS balance, such as cancer cells, have higher ROS levels, which can lead to oxidative stress.¹
- Oxidative stress refers to an imbalance within cells where more ROS is produced than eliminated.³
- High levels of oxidative stress can result in damage within a cell that can harm the cell's functions and can lead to programmed cell death (apoptosis).³

How does oxidative stress affect cancer cells?

- Cancer cells, including those involved in melanoma, operate at higher levels of oxidative stress than normal cells.² These higher levels can damage the cells but are not necessarily high enough to kill them.³
- The elevated oxidative stress levels in cancer cells may damage the cell in a way that supports accelerated growth, invasion and metastasis of cancer.¹

How can ROS and oxidative stress be involved in cancer treatment?

- A new class of targeted therapies is looking at ways to increase ROS levels to selectively kill cancer cells while leaving normal, non-cancerous cells unharmed.³
 - In cancer cells, ROS levels are closer to a tipping point.² This means that ROS can be raised to reach an oxidative stress threshold that causes the cancer cells to die.^{3,5}
 - Meanwhile, normal cells can still process this increased ROS to maintain a balance with little to no detectable effect on the cells.³
- ROS-generating agents also may make many cancer cells more vulnerable to the effects of conventional anti-cancer therapies, such as certain chemotherapies and radiation.^{3,5,6}

REFERENCE

1. Karihtala P, Soini Y. Reactive oxygen species and antioxidant mechanisms in human tissues and their relation to malignancies. Review article APMIS 2007;115:81-103.
2. Laurent A, et. Al. Controlling Tumor Growth by Modulating Endogenous Production of Reactive Oxygen Species. Cancer Res 2005;65:(3)948-956.
3. Pelicano H, et. Al. ROS stress in cancer cells and therapeutic implications. Drug Resistance Updates 2004;7:97-110.
4. Schumacker P. Reactive oxygen species in cancer cells: Live by the sword, die by the sword. Cancer Cell 2006;175-176.
5. Renschler M. The emerging role of reactive oxygen species in cancer therapy. European Journal of Cancer. 2004;40(13):1934-1940.