NASCIC
SCI RESEARCH
ADVOCACY COURSE

Module 6 – Neuroprotection

Targeting Free Radicals

Another experimental neuroprotection strategy is to reduce excessive levels of free radicals without blocking them from performing their essential functions.

"Radicals" are molecules that are unstable because they have unpaired electrons in their outer shell. Their instability causes them to react with other molecules as a way to "steal" an electron, which in turn causes those molecules to destabilize and react with other molecules in a chain reaction that leads to damage to cells and tissues.

After an SCI, uncontrolled or excessive production of free radicals causes the destruction of cell membranes, proteins, and DNA, and this destruction then leads to cell death.

There are many sources of radicals. Some radicals come from inside cells, especially from damaged or dysfunctional mitochondria, which are special structures inside our cells that produce the energy our cells need to function. Radicals also come from sources outside the cells; one example is iron that enters the SCI from bleeding. Radicals can be transferred from one cell to another, such as from macrophages to neurons.

One approach to targeting free radicals is to develop drug candidates that act as antioxidants to neutralize excess radicals before they cause damage; antioxidants are molecules that can safely donate an electron to stabilize a radical without becoming unstable themselves.

Another approach is to prevent mitochondria from producing excess radicals by removing dysfunctional mitochondria, stimulating cells to produce new mitochondria, injecting new mitochondria into cells, or manipulating the way mitochondria function. The next video describes mitochondria and their importance in SCI research.