Head Injury Study: Melatonin Is Neuroprotective

Curcumin Shown to Inhibit Tumor Angiogenesis

APN, a membrane-bound enzyme (CD13/aminopeptidase N), is found in tumor and other types of blood vessels undergoing the formation and differentiation of blood vessels (angiogenesis). However, it is not found in the vessels of other normal tissues. Because of this, APN is considered critical in anticancer therapies that seek to block tumor angiogenesis and metastasis. Curcumin, a potent chemopreventive agent, is now in clinical trials because it binds to APN and blocks its activity, thereby inhibiting tumor cell invasion and angiogenesis.

In recent studies, curcumin inhibited the invasiveness of human cancer cells (melanoma and fibrosarcoma) that contained APN, indicating that APN is the direct target for curcumin anti-invasive activity. Curcumin also inhibited growth-factor-induced angiogenesis in endothelial cells.

The study authors conclude that targeted APN inhibition is a novel approach to prevent tumor angiogenesis and metastasis, and that the possible development of potent derivatives of curcumin may be considered, since APN has been defined as the functional target of the compound for antiangiogenesis.

—Carmia Borek, PhD

Reference


Researchers at Israel's Hebrew University in Jerusalem report that melatonin, a hormone with antioxidant activity that is produced in the brain's pineal gland, is neuroprotective.*

Traumatic brain injury leads to massive production of reactive oxygen species, which in turn increases brain damage. Melatonin enhances brain antioxidants, including vitamin C, and blocks nuclear factor-kappa beta (NF-kB), a gene that regulates pro-inflammatory substances.

The use of melatonin as a therapeutic strategy may stimulate beneficial antioxidants and inhibit destructive responses such as inflammation.

In the study, mice subjected to closed head injury were tested one hour later for neurological damage, using the Neurological Severity Score. They were then injected with melatonin or a substance in which melatonin is administered but which lacks melatonin. The Neurological Severity Score was reevaluated 24 hours later. The response to melatonin showed a bell-shaped curve— that is, neuroprotection was achieved in animals given 5 mg/kg but not in those given 1 mg/kg or 10 mg/kg.

Melatonin facilitated recovery and caused a twofold decrease in brain lesion size.

Treatment with 5 mg/kg produced a sustained (four-day) increase in total antioxidants (yet to be identified) and a higher content of vitamin C in the brain cortex. Antioxidant levels were unaffected by the neuroprotective endocannabinoid 2AG given after injury, underscoring the specificity of melatonin-induced neuroprotection.

Melatonin blocks the AP-1 and NF-kB genes that are activated in closed head injury. NF-kB regulates numerous genes, including production of pro-inflammatory cytokines that interact with free radicals and exacerbate brain injury.

The authors suggest that the use of melatonin as a therapeutic strategy may stimulate beneficial antioxidants and inhibit destructive responses such as inflammation.

—Carmia Borek, PhD

Reference

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