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Can a High-Tech Medicine Render Radiation Harmless?

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Theme: Science and Medicine

Will Scientists Figure Out How to Protect Us from Radiation?

We've spent countless hours researching and writing about ways to reduce the harmful effects from radiation.

But there may be high-tech breakthroughs on the horizon.

As Dot Met reported in 2009:

> Researchers might have found a way to protect cells from radiation damage.
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> In a study published in the new AAAS journal Science Translational Medicine [here's the study; the prestigious journal Nature also commented on the study], researchers at the University of Pittsburgh School of Medicine and the National Cancer Institute found that they could protect healthy cells from radiation injury by turning off an inhibitory pathway that regulates nitric oxide.
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> "[Nitric oxide] is a bio gas, produced by enzymes in cells, and flies around almost at light speed compared to other processes," Jeff Isenberg, M.D., a professor at Pitt's school of medicine, tells DOTmed News.
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> While nitric oxide mostly works to prevent clotting of arteries, it also appears to help animals survive stress conditions.
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> But Dr. Isenberg and his team made the discovery that by switching off a related inhibitory pathway that controls nitric oxide, they could give animals "near immunity to record levels of radiation," he says.
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> In mice, when Dr. Isenberg and his team introduced a drug that prevented a protein, thrombospondin-1, from binding to a surface cell receptor called CD47, the animals could endure almost unheard-of doses of radiation with virtually no ill effects.
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> In cellular studies, cells could withstand up to the tested amount: 60 Gy. And in whole animal studies, mice could endure the limit they were given: 40 Gy.

40 Gy is a much higher level of radiation than is normally used in studies.

Interestingly, the study notes that mice that are naturally lacking in the nitric oxide-suppressing genes are "profoundly resistant to radiation injury".

Dot Med continues:

> Shockingly, the irradiated rodents were almost completely unharmed. Other than some mild hair loss at the site of dosage, there was almost no cell death or damage when histological samples were checked.
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> "There was no skin laceration or muscle loss," Dr. Isenberg says. "When we stained for cell death, we didn't even see significant loss of bone marrow, which is exquisitely sensitive…to radiation damage."
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> In comparison, control mice — who didn't get the pathway-blocking treatment — were eaten away with tissue loss and "frank necrosis of the limbs."
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> Currently, his lab is working toward getting funds for toxicology tests so at some point drugs could be developed for humans. He also plans studies to see how long an effective dose lasts — would someone get one-month, or one-year immunity following a dose?
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> Also, a bigger mystery is figuring out how, by blocking this pathway, cells are able to fix the damaged DNA within. Dr. Isenberg says they know that following radiation exposure, the DNA is scrambled, but somehow, with this treatment, the cells are able to get themselves right.
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> "It's not that we're blocking radiation from hitting the tissue," he says. "Somehow…they repair themselves, and go about their business."

This treatment is not a cure-all. Specifically, high doses of radiation would like cause damage through over-heating our cells:

> At some point radiation would damage tissue through thermal energy, which this process might not be able to stop.

And scientists don't yet know whether or not this treatment might have harmful long-term side effects:

> Research may reveal why we aren't born with the inhibitory pathway already blocked. Dr. Isenberg says the process probably evolved when deep sea fishes emerged on land, and somehow was used to regulate changes in internal pressure. So would turning it off create other, unwanted effects? Although none were seen in the studies, nitric oxide is a powerful vasodilator, he says, and maybe the body needs some way to control it.

Note: A Russian team of scientists also found that adjusting nitric oxide levels can protect cells from radiation.

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