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Dr. Léon Sanche, Department of Nuclear Medicine and Radiobiology at the Université de Sherbrooke

Innovations in Cancer Therapy

Simultaneous chemotherapy and radiation may benefit cancer treatment

By Katharine Found

Cancer patients are typically exposed to chemotherapy and radiation therapy in separate treatment rounds, doubling their emotional and physical stress. But new research by a physicist at the University of Sherbrooke suggests a change to this traditional protocol may be warranted.

Dr. Léon Sanche of the Department of Nuclear Medicine and Radiobiology, along with his multidisciplinary team of scientists, are working on the mechanisms involved in the concomitant application of chemotherapy and radiation therapy. In this case, there is a synergistic effect that greatly increases the effectiveness of cancer therapy when both treatments are administered during the same period of time.

Sanche, who holds the Canada Research Chair in Radiation Sciences, is pleased with the results.

“This research is promising,” says Sanche. “It opens doors and creates new avenues to make cancer treatment more successful.”

To discover the basic chemical mechanisms of this effect, Sanche had to go back to the basics of radiobiology, and determine what exactly happens at a cellular level when radiation is used. His findings showed the importance of combining the two therapies.

Radiation therapy involves emission of high-energy photons – particles which penetrate the body quickly and easily. Once emitted, these rapidly create low-energy secondary electrons, which cause cells (including cancer cells) to die by damaging DNA.

Sanche wondered how the low-energy electrons could be targeted more specifically at cancer cells, and turned his thoughts to gold nanoparticles. Research in his laboratories suggested that microscopic gold particles exposed to radiation produced large quantities of the cell-killing low-energy electrons. He notes they also essentially target cancer cells and not normal cells because of the difference in vascularization. He says “blood vessels serving cancer cells are leakier and allow the particles to enter much more easily.”

Therefore, combining the gold particles in a chemotherapeutic agent and following with radiation may be more effective. “The low energy electrons, produced in large quantities by radiotherapeutic treatment, could focus their energy directly on the cancer cells to damage the DNA,” says Sanche.

This treatment has been successfully tested on laboratory animals and Sanche is confident that it will be as effective for humans with different cancer types, such as brain cancer.

“The concept of synchronous use of radiation with chemotherapeutic agent is gaining popularity in the clinic, but to exploit the enormous potential of this modality, further fundamental research is needed. It will be very rewarding when we fully understand the phenomena involved in this type of combined modality therapy”, he says.

Other researchers involved with this study are Drs. Benoit Paquette, Darel Hunting and Richard Wagner, Department of Nuclear Medicine and Radiobiology. Funding for this research was provided by the Canadian Institutes of Health Research.

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