Staff Writer
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A Deadly Diet for Viruses

In a global webinar presentation on November 28, Sylvester Comprehensive Cancer Center researcher Dr. Theodore J. Lampidis will explain how a potential cancer therapy is being used in India to treat COVID-19 patients.

Dr. Theodore J. Lampidis will explain how more than two decades spent exploring a potential cancer treatment led to its use with COVID patients in India.

Dr. Lampidis, who is also professor of cell biology at the University of Miami Miller School of Medicine, will discuss how a simple sugar, 2-deoxy-D-glucose (2-DG), that he and his

laboratory have been working with for the past 21 years might be used as a universal cancer treatment. He will present data on the mechanisms and pathway by which 2-DG exploits increased glucose metabolism in cancer cells, how this can be extended to viral-infected cells, and the relevance to 2-DG being approved in India to fight SARS-CoV-2.

“I began my studies here at UM on the anti-cancer mechanisms of 2-DG 21 years ago with the following reasoning: within every solid tumor there are cancer cell populations that are not actively dividing and therefore are not sensitive to most chemotherapeutic and radiation treatments, which depend on replication to be effective,” Dr. Lampidis said. “Therefore, if cells are not actively replicating, they are resistant to these treatments.”

Why a Tumor is Like an Egg

Dr. Lampidis suggests thinking of a solid tumor like an egg, in which the white part of the egg contains the rapidly dividing cells, but the yolk contains the slow or non-dividing cancer cells. Conventional treatment that is effective against the white part of the egg still leaves behind the yolk cells that can subsequently give rise to more replicating cells. He says it explains why conventional treatments often cannot successfully get rid of the entire tumor.

“Since these ‘yolk’ cells are found in the inner core of the tumor, where they don’t receive enough oxygen, simple biochemical principles dictate that they have to rely exclusively on glucose to survive,” Dr. Lampidis explained. “When fed a false sugar like 2-DG, cancer cells take it up readily thinking it is glucose, but it is not. That enables

you to block glycolysis – the process by which cells metabolize glucose – and literally starve those 'yolk' cancer cells to death. Indeed, my colleagues and I were able to show just that in tumor cells grown under low oxygen in petri dishes as well as in cancer animal models."

These findings led to a small Phase I clinical trial that was conducted at Sylvester and several other cancer centers. The major finding of that study and follow-up research was that 2-DG was most effective when dispensed in slow, controlled doses using an implantable device.

A Research Collaboration with a Virus

A discussion of his team's findings with a colleague – Enrique Mesri, Ph.D., another Sylvester member and a professor of microbiology and immunology – resulted in a collaboration in testing 2-DG in Kaposi's Sarcoma Herpes Virus-infected cells, unraveling the mechanisms by which this virus drives Kaposi's sarcoma, the most prevalent cancer in AIDS patients. Dr. Mesri is an expert in this area, and together the researchers showed that 2-DG affected similar pathways that were found to kill cancer cells but in this case were blocking viral replication.

Upon Drs. Lampidis and Mesri publishing their data, other researchers reported similar findings with a virus that causes hemorrhagic crises and death in pigs. That virus is a coronavirus, and recently similar antiviral effects published about SARS-CoV-2 led to 2-DG's emergency approval by the Indian government for use against COVID-19.

It has been discovered that similar mechanisms responsible for increasing glucose metabolism in cancer cells are also at work

in viral-infected cells. Thus 2-DG is unique in that it acts as both an anti-cancer and an anti-viral agent, selectively accumulating in cancer and viral-infected cells by exploiting the inherent trait in both cell types – increased glucose uptake and metabolism. Drs. Lampidis and Mesri have just published an article in *IUBMB Life*, the journal of the International Union of Biochemistry and Molecular Biology, that explains the relevance of those findings to 2-DG's use in India.

The webinar, which will originate from India, will be held on Sunday, November 28, at 9 a.m. Eastern Standard Time. To register, please click here.

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