

Fungicide used on farm crops linked to insulin resistance

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A fungicide used on farm crops can induce insulin resistance, a new tissue-culture study finds, providing another piece of evidence linking environmental pollutants to diabetes. The results will be presented at The Endocrine Society's 94th Annual Meeting in Houston.

"For the first time, we've ascribed a molecular mechanism by which an environmental pollutant can induce insulin resistance, lending credence to the hypothesis that some synthetic chemicals might be contributors to the diabetes epidemic," said investigator Robert Sargis, M.D., Ph.D., instructor in the endocrinology division at the University of Chicago.

The chemical, tolylfluanid, is used on farm crops in several countries outside of the United States to prevent fungal infestation, and sometimes is used in paint on ships to prevent organisms from sticking to their hulls. Animal studies have indicated that the chemical may adversely affect the [thyroid gland](#), as well as other organs, and that it may increase the risk of cancer in humans.

Within the last decade, research attention has increasingly focused on the link between environmental contaminants and the rising rates of obesity and diabetes throughout many parts of the world. In the United States alone, nearly 26 million adults and children have some form of diabetes, according to the American Diabetes Association. A serious disease by itself, diabetes also increases the risk of other medical complications, including heart and blood-vessel diseases.

Normally, the pancreas secretes the [hormone insulin](#), which acts to regulate blood-sugar levels. Among diabetic patients, [insulin secretion](#) either decreases or stops altogether, or cells become resistant to the hormone's activity. These conditions then disrupt the process that transports sugar, or glucose, from the blood to the body's other cells, which can lead to the dangerously high blood-sugar levels associated with diabetes.

In this project, Sargis and his co-investigators used mouse fat to examine the effects of tolylfluanid on insulin resistance at the cellular level. They found that exposure to tolylfluanid induced [insulin resistance](#) in fat cells, which play a critical role in regulating the body's blood glucose and fat levels. When exposed to tolylfluanid in culture the ability of insulin to trigger action inside the fat cell, or adipocyte, was reduced, which is an early indication of diabetes.

"The fungicide and antifouling agent tolylfluanid may pose a threat to public health through the induction of adipocytic-insulin resistance, an early step in the pathogenesis of type 2 diabetes," Sargis said. "Based on these studies, further efforts should be undertaken to clarify human exposure to tolylfluanid and the possible metabolic consequences of that exposure."

At the same time, tolylfluanid-exposed cells stored more fat, or lipids, in a similar action to a steroid called corticosterone. Like this steroid, tolylfluanid bound receptors in fat cells, called glucocorticoid receptors, which help regulate blood-sugar levels, as well as many other important body processes.

"For the public, this raises the specter of environmental pollutants as potential contributors to the metabolic disease epidemic," said Sargis, adding that, "hopefully, it will put further pressure on public policy makers to reassess the contribution of environmental pollution as a

contributor to human disease in order to encourage the development of strategies for reversing those effects."

Provided by The Endocrine Society

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