

Diabetes Linked to Low Testosterone

Type 2 diabetes risk associated with low testosterone levels



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If you are a man with diabetes, you are twice as likely as other men to suffer from low testosterone. But does it work the other way around? Can low testosterone boost your risk for diabetes?

Low levels of testosterone may affect how a man's body reacts to insulin, a hormone that helps control levels of blood sugar.

This finding suggests that low testosterone may increase the risk of type 2 diabetes.

This study - which was conducted by Dr. Kerry McInnes and her colleagues at the University of Edinburgh - is the first to show how low testosterone directly influences the development of type 2 diabetes.

Testosterone is a hormone found throughout the body. Past research has found links between low testosterone and obesity, the main cause of diabetes worldwide.

The hormone works on the body through molecules called androgen receptors. These molecules allow the testosterone to activate genes associated with obesity and diabetes.

"Clinically, low testosterone has been strongly correlated with metabolic syndrome in men," explains Parviz Kavoussi, M.D., a urologist at Austin Fertility & Reproductive Medicine in Austin, Texas.

"The metabolic syndrome includes a complex association of health issues that ultimately increase the risk for heart disease and progression to type 2

diabetes. These risk factors include high serum glucose, high triglycerides, high body mass index, high waist-to-hip ratio, high total body fat mass, and high fasting insulin resistance index. When men are treated with testosterone replacement therapy, treatment can improve the metabolic syndrome. Replacing a man's testosterone helps reduce abdominal fat mass and improves insulin action and glucose levels have been shown to come down. This information has been learned through clinical studies but we need more basic science studies to understand the 'why' and 'how' these mechanisms respond," says Dr. Kavoussi.

The study by Dr. McInnes and colleagues showed that mice with weakened testosterone function had a higher risk of being insulin resistant, meaning their bodies did not react normally to insulin. Insulin resistance can lead to high blood sugar levels and eventually diabetes.

Mice with impaired testosterone were more likely to be insulin resistant regardless of their body weight, another factor that can influence insulin resistance.

According to Dr. McInnes, it is already known that men with low testosterone have a higher risk of becoming obese, which also boosts their risk of diabetes.

"This study shows that low testosterone is a risk factor for diabetes no matter how much a person weighs," she says.

In the study, mice without androgen receptors in their fat tissue grew fatter and became fully resistant to insulin when fed a high-fat diet.

The researchers think that a protein called RBP4 is involved in controlling insulin resistance when the affects of testosterone are weakened. This is because mice with impaired testosterone had higher levels of RBP4.

Eventually, these findings could lead to treatments that target RBP4, thus lowering the risk of diabetes in men with low testosterone. However, more research is needed before scientists can know if the process works the same in humans.

"This study is a great step in the direction of helping us understand the interplay between testosterone, fat, and the impact on metabolic syndrome and diabetes," says Dr. Kavoussi.

According to Dr. Iain Frame, Director of Research at Diabetes UK, "We already know that low testosterone levels are associated with increased obesity and therefore with increased risk of developing Type 2 diabetes, but this study provides evidence that there can be increased risk even when body mass is not affected."

"Yet while testosterone-impaired mice developed insulin resistance whatever diet they were given, the effect was considerably more pronounced on those fed on a high fat diet. This reinforces Diabetes UK advice that a healthy balanced diet is important for everyone and particularly for those already at high risk of developing Type 2 diabetes."

"Further work is needed to translate these initial findings into clinical practice, as it is important to emphasize that results in mice may not necessarily have direct relevance for humans," Dr. Frame continues explaining.

"But good basic research such as this represents early steps towards potential new treatments and we are pleased to see research we have funded producing useful results which may benefit people living with diabetes at some point in the future."

The study, which was funded by Diabetes UK, is published in *Diabetes*, a journal of the American Diabetes Association.

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Parviz Kavoussi, M.D. is an expert in erectile dysfunction, sexual medicine and male infertility. He is in practice with his infertility specialist father and brother where they pride themselves in being a family that helps others start their families.

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