

# Low testosterone levels could raise diabetes risk for men

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Low levels of testosterone in men could increase their risk of developing diabetes, a study suggests.

Scientists have found that low [testosterone](#) levels are linked to a resistance to insulin, the hormone that controls [blood sugar levels](#).

The study is the first to directly show how low [testosterone levels](#) in [fat tissue](#) can be instrumental in the onset of [Type 2 diabetes](#).

Testosterone is present throughout the body. Low testosterone levels are linked to [obesity](#), a known risk factor for diabetes.

It acts on [fat cells](#) through molecules known as [androgen receptors](#). These enable the testosterone to activate genes linked to obesity and diabetes.

The research showed that mice in which the function of testosterone in fat tissue was impaired were more likely to be insulin resistant than mice in which the role of testosterone was not hindered.

The study showed that insulin resistance occurred in mice when the function of testosterone was impaired regardless of body weight.

The findings from the University of Edinburgh could also help explain why older men are more at risk of developing diabetes, because testosterone levels fall in men as they age.

Dr Kerry McInnes, from the University of Edinburgh's Endocrinology Unit, said: "We know that men with low testosterone levels are more likely to become obese, and as a develop diabetes. This study shows that low testosterone is a risk factor for diabetes no matter how much a person weighs. As men age their testosterone levels lower. This, along with increasing obesity, will increase the incidence of diabetes."

The study, funded by Diabetes UK showed that mice, which did not have androgen receptors in fat tissue for testosterone to attach to, were more likely to show signs of insulin resistance than other mice.

Researchers found that mice without androgen receptors in fat tissue also became fatter than other mice and developed full insulin resistance when both types were fed a high-fat diet.

Scientists believe that a protein called RBP4 plays a crucial role in regulating insulin resistance when testosterone is impaired.

They found that levels of RBP4 were higher in mice in which the role of testosterone was impaired.

The Edinburgh team say that its findings could lead to the development of new treatments that regulate production of RBP4 and reduce the risk of diabetes in men with lower levels of testosterone.

Researchers are now planning to study patients with Type-2 diabetes to see if their levels of testosterone correlate with levels of RBP 4.

Dr Iain Frame, Director of Research at Diabetes UK, said: "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 emphasise that results in mice may not necessarily have direct relevance for humans. 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."

Provided by University of Edinburgh

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