

## NTU study find ways to prevent muscle loss, obesity and diabetes

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**Singapore:** A research study from Nanyang Technological University (NTU) has yielded important breakthroughs on how the body loses muscle, paving the way for new treatments for aging, obesity and diabetes.

The study found that by inhibiting a particular molecule produced naturally in the body, muscle loss due to aging or illnesses can be prevented. Blocking the same molecule will also trigger the body to go into a 'fat-burning mode' which will fight obesity and also treat the common form of diabetes.

The exciting discoveries have led NTU scientists to embark on joint clinical research with local hospitals to further validate their findings which were previously carried out on animals.

Their research on how humans lose muscle during extreme conditions such as chronic diseases or starvation was published last month in *Cell Metabolism*, a prestigious journal known for publishing biological breakthroughs. Associate Professor Ravi Kambadur and his team from the NTU School of Biological Sciences found that a protein called Myostatin, which controls muscle cell growth, is responsible for initiating muscle loss.

When excess levels of Myostatin is bound to a muscle cell, it induces heavy loss of mitochondria (the part of the cell responsible for energy production that keeps a cell alive), which in turn causes the muscle cell to waste or lose muscle tissue (atrophy) due to the 'lack of energy'.

Under normal healthy conditions, small loss of Mitochondria is needed for the regeneration of new cells, but when a patient is

suffering from chronic diseases or is bedridden (and muscles are not used often), this process is disrupted due to high levels of myostatin which results in increased mitochondrial loss and muscle atrophy. Prof Kambadur said recent studies have shown that extreme muscle wasting can lead to death.

"For example, about 30 per cent of cancer patients die not because of cancer, but because of muscle loss also known as cachexia," said Prof Kambadur. "When someone is suffering from a chronic disease and doesn't eat enough, the body starts to generate energy by breaking down muscle proteins and that is the reason we see a lot of muscle wasting under chronic disease conditions."

"Over the years, our research has revealed that this type of muscle wasting is initiated by excess levels of myostatin in the body. If we block myostatin from binding to cells, then muscles won't waste away and we can then mitigate the effects of aging and chronic diseases."

Apart from regulating the growth and loss of muscle, myostatin also regulates whether the body will burn fat or carbohydrates during fasting and meal times. Blocking myostatin keeps the body in "fat-burning mode" and promotes muscle growth at the same time - which could potentially make obesity a thing of the past.

Because obesity is one of the main causes of the most common form of diabetes, Type 2 diabetes, blocking myostatin could also treat diabetes. In the US, 90 to 95 per cent of diabetes cases are Type 2, as reported by the Centers for Disease Control and Prevention. According to Singapore's Health Promotion Board, diabetes is among the top ten causes of death locally. In 2010, it was reported by Ministry of Health that 11.3 per cent of the Singaporean adults aged 18 to 69 years are affected by diabetes while 10.8 percent were obese.

"In near future, myostatin blockers could increase fat utilisation in the body and give you the benefits of exercise, without actually doing intense physical activity," Prof Kambadur explained. "This would be a good alternative treatment for people who are unable to exercise, such as those who are bed-ridden or are in cancer treatment, who are most at risk of massive muscle loss."

Prof Kambadur added that while blocking myostatin sounds like a good idea, there is a need to study the long term effects, as the molecule is needed to regulate cell growth for normal body operation.

Other studies on myostatin conducted by Prof Kambadur's group have also yielded interesting results. For instance, people who exercise regularly have been found to have lower levels of myostatin as compared to those who do not. Studies have also found that older people have more myostatin and this can explain why when one ages, muscles become weaker.

Prof Kambadur's research projects on myostatin are funded by Ministry of Education, Biomedical Research Council and the National Research Foundation's (NRF) Competitive Research Programme (CRP). The research on myostatin is conducted in collaboration with Associate Professor Mridula Sharma from the National University of Singapore. The husband-and-wife team have collaborated on various research projects in the area of skeletal muscle for many years.