Study showing how blood Vessels are damaged by high sugar levels.

A study that was published in the Journal of Biological Chemistry on the 28th of January 2011 has identified a key mechanism that contributes to blood vessel damage.

University researchers say studies in mice show that the damage appears to involve two enzymes, fatty acid synthase (FAS) and nitric oxide synthase (NOS), these interact in the cells that line blood vessel walls.

“We already knew that in diabetes there’s a defect in the endothelial cells that line the blood vessels,” says first author Xiaochao Wei, PhD. “People with diabetes also have depressed levels of fatty acid synthase. But this is the first time we’ve been able to link those observations together.”

Wei studied mice that had been genetically engineered to make FAS in all of their tissues except the endothelial cells that line blood vessels. These so-called FASTie mice experienced problems in the vessels that were similar to those seen in animals with diabetes.

“It turns out that there are strong parallels between the complete absence of FAS and the deficiencies in FAS induced by lack of insulin and by insulin resistance,” Semenkovich says.

Comparing FASTie mice to normal animals, as well as to mice with diabetes, Wei and Semenkovich determined that mice without FAS, and with low levels of FAS, could not make the substance that anchors nitric oxide synthase to the endothelial cells in blood vessels.

“We’ve known for many years that to have an effect, NOS has to be anchored to the wall of the vessel,” Semenkovich says. “Xiaochao discovered that fatty acid synthase preferentially makes a lipid that attaches to NOS, allowing it to hook to the cell membrane and to produce normal, healthy blood vessels.”

In the FASTie mice, blood vessels were leaky, and in cases when the vessel was injured, the mice were unable to generate new blood vessel growth.

The actual mechanism involved in binding NOS to the endothelial cells is called palmitoylation. Without FAS, the genetically engineered mice lose NOS palmitoylation and are unable to modify NOS so that it will interact with the endothelial cell membrane. That results in blood vessel problems.

The bottom line is that the blood vessels are unable to regenerate. Because of this failure over time as the blood vessels become damaged the body cannot repair them. Because it cannot repair them and because the smallest blood vessels are the building blocks of most of our organs these organs start to fail.