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Antidiabetic effects of Aegle Marmelos via Blood Serum Analysis in Animal Species

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Abstract- Aegle Marmelos is a traditional medicinal plant in india which belongs to Rutaceae family which possesses innumerable health benefits. The entire plant body including its leaves, stem, root, inflorescence and seed are proved to be significant medicinal value and hence it is one among the inevitable plant used in the preparation of various ayurvedic pharmacological products. The plant is a rich source of various components including eugenol, Vicenin- 2, linoleic acid, oleic acid, rosmarinic Calcium, Phosphorous and many more. Its Ethanopharmacological properties such as Anti-diabetic, Anti- cancerous, Analgesic, Anti- inflammatory, Radiopreotective. In vivo toxicity study concluded that no mortality was find in toxicity study.

Keywords: Vicenin-2, chloroform, ethyl acetate, STZ, Gibenclamide

Introduction:

Type 2 Diabetes Mellitus (T2DM) is one of the most common metabolic disorders worldwide and its development is primarily caused by a combination of two main factors: defective insulin secretion by pancreatic cells and the inability of insulin-sensitive tissues to respond to insulin [1]. Insulin release and action have to precisely meet the metabolic demand; hence, the molecular mechanisms involved in the synthesis and release of insulin, as well as the insulin response in tissues must be tightly regulated. Therefore, defects in any of the mechanisms involved can lead to a metabolic imbalance that leads to the pathogenesis of T2DM.

As per the World Health Organization (WHO) diabetes mellitus is a chronic, metabolic disease characterized by elevated levels of blood glucose, which leads over time to damage to the heart, vasculature, eyes, kidneys and nerves. The organs involved in T2DM development include the pancreas, liver, skeletal muscle, kidneys, brain, small intestine, and adipose tissue [2].

Method

Serum Blood Investigation:

Serum lipid profile total cholesterol, triglycerides and high-density lipoprotein and liver enzyme were determined following the manufacturer's instructions [3-6].

Result

1. **Lipid profile Triglyceride**

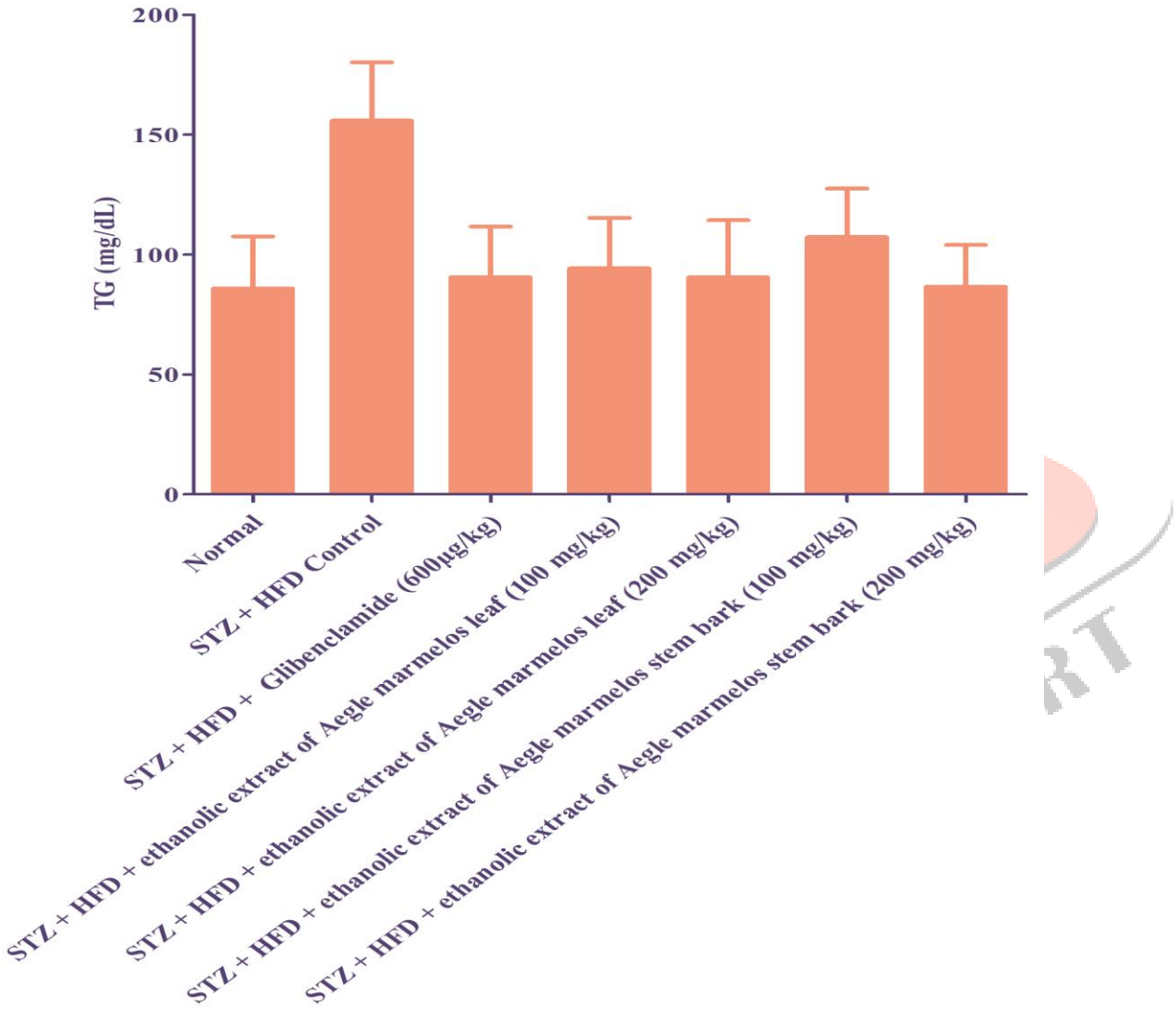

Figure 1: Antidiabetic effect of *Aegle marmelos* extract on serum lipid profile in STZ+HFD induced diabetic rats i.e. TG in STZ+HFD induced diabetic rats.

Values are expressed as mean±S.E.M. (n = 6).Values are statistically significant at # P<0.01 vs. normal group;**P<0.01, *P<0.05 vs. diabetes control group respectively (One-way ANOVA followed by Tukey's post hoc test).

A dose of 100 mg/kg and 200 mg/kg of *Ethanolic extract of Aegle marmelos leaf* (7.89±2.78) and 12.76±1.57), 100 mg/kg and 200 mg/kg of ethanolic extract of *Aegle marmelos*stem (11.56 ± 3.56) and (13.56±2.98) was significantly ($p < 0.05$) normalized the content of total protein. In glibenclamide 600mcg/kg (7.54±2.89) treated group total proteinnormalized significantly ($p < 0.05$) as shown in figure.

2. **Lipid Profile In Total Protein:**

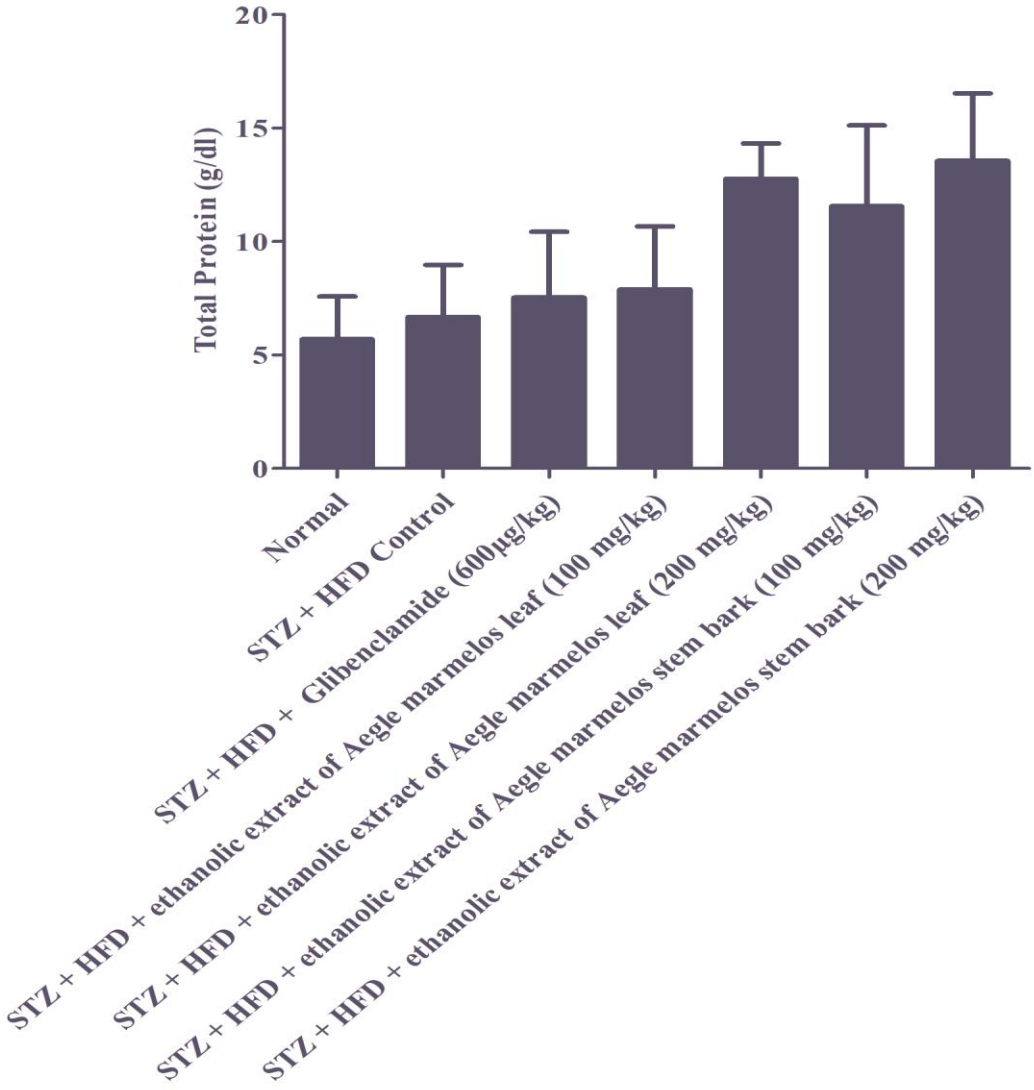

Figure 2: Antidiabetic effect of *Aeglemarmelos*extract on serum lipid profile in STZ+HFD induced diabetic rats i.e. TP in STZ+HFD induced diabetic rats.

Values are expressed as mean±S.E.M. (n = 6).Values are statistically significant at # P<0.01 vs. normal group;**P<0.01, *P<0.05 vs. diabetes control group respectively (One-way ANOVA followed by Tukey's post hoc test).

A dose of 100 mg/kg and 200 mg/kg of *Ethanolic extract of Aegle marmelos leaf* (65.37±3.41) and (58.38±2.5), 100 mg/kg and 200 mg/kg of ethanolic extract of *Aegle marmelos*stem (51.76±3.56) and (53.98±2.65) was increased significantly ($p < 0.05$) HDL cholesterol. A glibenclamide (600 mcg/kg) treatment group (55.7±3.88), HDL cholesterol increased significantly ($p < 0.05$) as shown in figure 2.

3. **Lipid profile HDL**

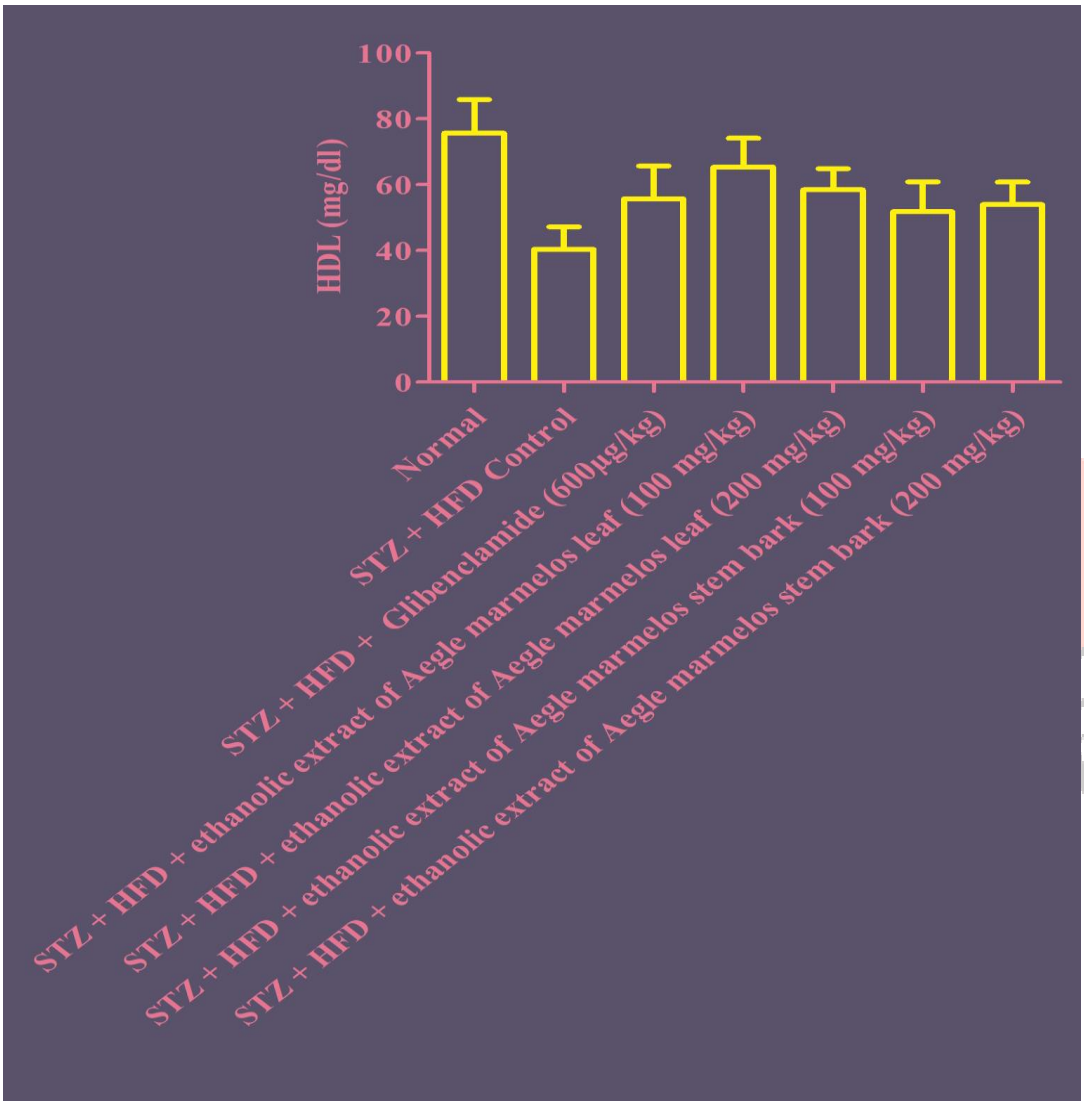

Figure 3. Antidiabetic effect of *Aeglemarmelos*extract on serum lipid profile i.e. HDL in STZ+HFD induced diabetic rats

Values are expressed as mean±S.E.M. (n = 6).Values are statistically significant at # P<0.01 vs. normal group;**P<0.01, *P<0.05 vs. diabetes control group respectively (One-way ANOVA followed by Tukey's post hoc test).

A dose of 100 mg/kg and 200 mg/kg of *Ethanolic extract of Aegle marmelos leaf* (130.43 ± 5.23) and (112.76±6.75), 100 mg/kg and 200 mg/kg of ethanolic extract of *Aegle marmelosstem bark* (135.85±5.78) and (125.98±8.68) was decreased significantly ($p < 0.05$) LDL cholesterol. In glibenclamide 600mcg/kg (88.45±5.63) treated group LDL cholesterol decreased significantly ($p < 0.05$) as shown in Figure 3.

4. SGPT

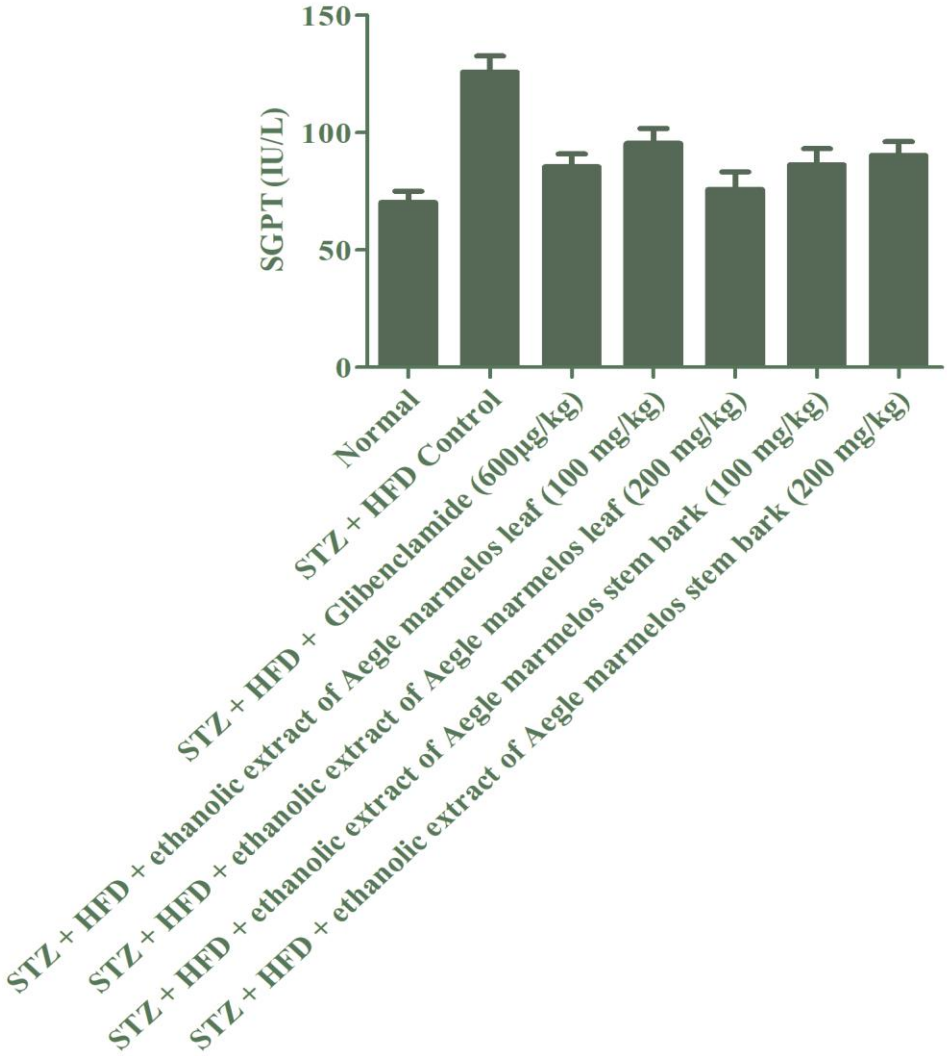

Figure 17. Antidiabetic effect of *Aeglemarmelos*extract on serum biomarkers i.e. SGPT in STZ+HFD induced diabetic rats

Values are expressed as mean±S.E.M. (n = 6).Values are statistically significant at # P<0.01 vs. normal group;**P<0.01, *P<0.05 vs. diabetes control group respectively (One-way ANOVA followed by Tukey's post hoc test).

A dose of 100 mg/kg and 200 mg/kg of *Ethanolic extract of Aegle marmelos leaf* (98.54 ± 4.87) and (76.64±5.37), 100 mg/kg and 200 mg/kg of ethanolic extract of *Aegle marmelos stem bark* (88.45±5.37) and (93.5±5.46)and glibenclamide 600 mcg/kg (65.87±5.87) treatment groups SGOT level was decreased significantly ($p < 0.05$) as compared to control group, respectively, as represented in Figure 4.

5. SGOT

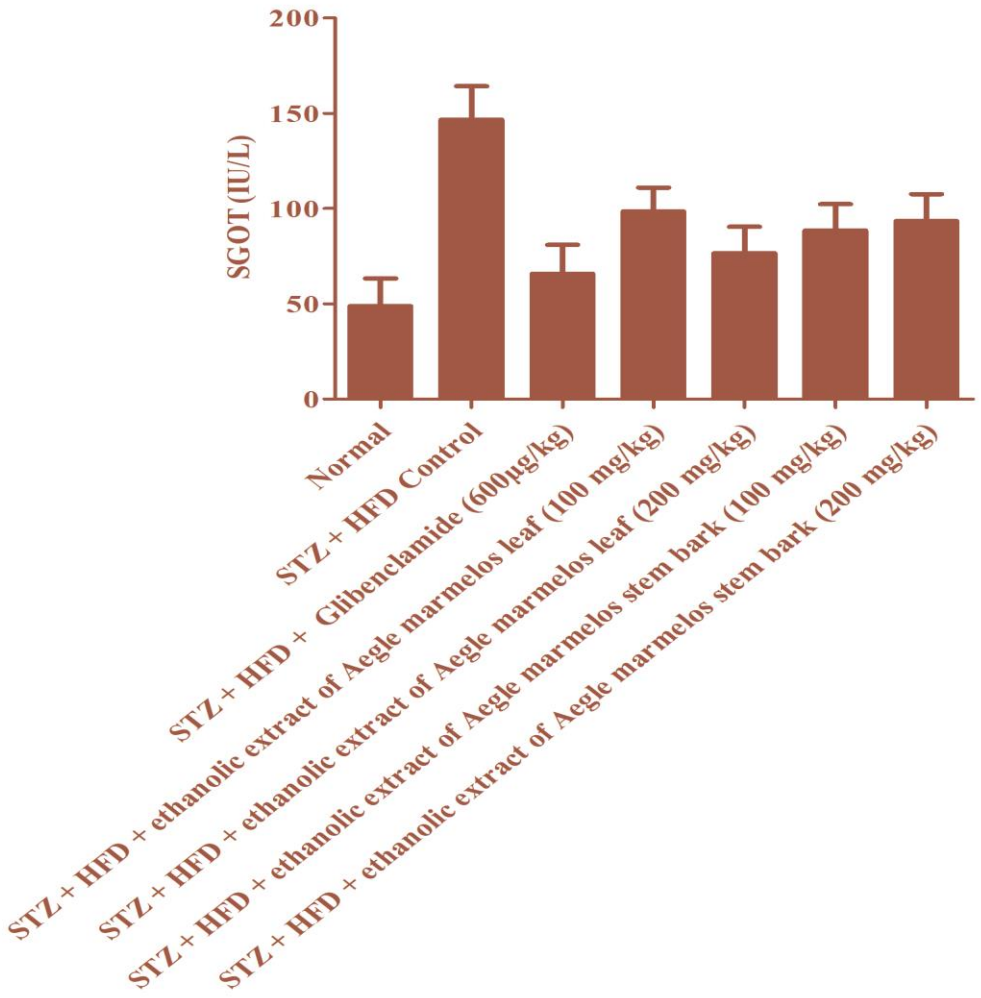

Figure 5. Antidiabetic effect of *Aeglemarmelos*extract on serum biomarkers i.e. SGOT in STZ+HFD induced diabetic rats

Values are expressed as mean±S.E.M. (n = 6).Values are statistically significant at # P<0.01 vs. normal group;**P<0.01, *P<0.05 vs. diabetes control group respectively (One-way ANOVA followed by Tukey's post hoc test).

From antioxidant study, it was found that in STZ+HFD induced diabetic control group, Super Oxide dismutase (SOD) level was decreased significantly ($p < 0.001$), while in treated group. A dose of 100 mg/kg and 200 mg/kg of *Ethanolic extract of Aegle marmelos leaf* (9.38±1.78) and (12.76±1.25), 100 mg/kg and 200 mg/kg of ethanolic extract of *Aegle marmelos stem bark* (13.92 ± 1.88) and (12.56 ± 1.56) was increased significantly (p <

0.001) SOD level. In 600 mcg/kg glibenclamide (7.85 ± 1.88) SOD level increased significantly ($p < 0.001$), as represented in Figure 5.

Discussion & Conclusion:

The generation of ROS is highly implicated in the relationship between mitochondrial dysfunction and insulin resistance. ROS production takes place mainly at complex I and complex III of the ETC and increases when ETC is not able to handle excessive electron input. In these circumstances, as a consequence of nutrient overload, electron supply to the mitochondrial ETC increases and the electron excess is transferred to oxygen generatingO2 and subsequent hydrogen peroxide [8].

In the liver, insulin does not only regulate glucose production/utilization but also aects lipid metabolism more broadly. When circulating glucose levels increase and insulin is secreted by pancreatic cells, insulin binding to liver INSR induces autophosphorylation of the receptor. Consequently, insulin receptor substrates (IRSs) are recruited and phosphorylated.

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