

# ***Evaluation of the combination effect of voluntary exercise and testosterone on angiogenesis and its intra cellular signaling pathway in the heart of gonadectomized diabetic male rats***

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## ***Abstract***

***Introduction:*** Cardiovascular disease is the main cause of mortality in diabetes that the main reasons of this is inhibited angiogenesis in the heart.

***Methodes:*** 54 male Wistar rats (200-250) were divided into nine groups: 1- sham 2-Diabetic 3-Diabetic + Testosterone 4-Diabetic + Exercise 5-Diabetic + Testosterone+ Exercise 6-Diabetic castrated 7-Diabetic castrated + Testosterone 8-Diabetic castrated + Exercise 9-Diabetic castrated + Testosterone+ Exercise. Rats in castrated groups were anesthetized with ketamine hydrochloride (80 mg/kg) and xylazine hydrochloride (5 mg/kg). Then the testes removed. Type 1 diabetes was induced by i.p injection of 55 mg/kg of streptozotocin in all rats. All rats treated with testosterone (2mg/Kg/day) and voluntaru exercise for two weeks. After the treatment period, anesthesia was induced intraperitoneally with sodium pentobarbital (mg / kg 60). Blood samples was collected from the heart for measuring lipid profile, HbA1c and heart tissue was isolated for evaluate angiogenesis, the expression MIR- 126, MIR- 132 and SDF-1a, VEGF-A proteins.

***Result:*** 1- Castration caused dyslipidemia and increased glycosylated hemoglobin.2- Testosterone and exercise alone or in combination reduced HbA1c and improved dyslipidemia.3- Castration reduced the SDF-1a, VEGF-A proteins.4- Testosterone and exercise alone or in combination increased SDF-1a, VEGF-A proteins.5- Castration decrease MIR-126 and MIR-132. 6- Testosterone and exercise alone or in

*combination increased MIR-126 and MIR-132. 7- Testosterone and exercise alone or in combination increased angiogenesis.*

***Conclusion:*** *Testosterone and exercise can promote neoangiogenesis in diabetic and castrated diabetic rats. The proangiogenesis effect of testosterone and exercise is associated with the enhanced expression of VEGF-A, SDF-1a proteins, MIR-126 and MIR-132.*

***Keywords:*** *Diabetes, Exercise, Testosterone, Angiogenesis, Heart tissue*