SUMMARY

Obesity is a major health problem, and with the increasing number of obese individuals worldwide an explosion of obesity-related health problems has become evident. Obese individuals develop resistance to the cellular actions of insulin which has devastating consequences that can cause major disease states.

Adiponectin which is considered as an insulin-sensitizing factor has now been added on the list as a new and a very exciting player in the field of obesity related insulin resistance.

Physical exercise is promoted as one of the primary therapeutic strategies available to increase insulin sensitivity, interestingly the insulin sensitizing effects of exercise have similar metabolic effects as adiponectin in that exercise also promotes glucose uptake into the muscle and increase fatty acid oxidation.

This study was carried out in order to clarify the relationship between the obesity induced insulin resistance, adiponectin receptors expression and increased physical activity.

This study was carried on 5 main groups of adult male mice. The first of them is the control group received balanced diet in which fat represents12% of the total caloric requirement for 16 weeks. The 2nd group received high fat diet- in which the fat represents 60% of the total caloric requirement- for 16 weeks. The 3rd group received high fat diet for 20weeks, and they were divided into 2 subgroups the first only received the high fat diet for 20 weeks, while the second received the

high fat diet for 20 weeks, and were submitted for exercise for 45 minutes /day for the last 4 weeks before decapitation. The 4th group received high fat diet for 22weeks, and they were divided into 2 subgroups, the first only received the high fat diet for 22 weeks, while the second received the high fat diet for 22 weeks ,and were submitted for exercise for 45 minutes /day for the last 6 weeks before decapitation. The 5 th group received high fat diet for 24weeks, and they were divided into 2 subgroups, the first only received the high fat diet for 24 weeks, while the second received the high fat diet for 24 weeks ,and were submitted for exercise for 45 minutes /day for the last 8 weeks before decapitation.

The parameters used to evaluate the insulin resistance were plasma insulin level, plasma glucose level and HOMA. Expression of adiponectin receptors 1 and 2 was detected in skeletal muscle and liver using RT-PCR.

The obtained results of this study could be summarized as follow:

- The consumption of high fat diet -in which the fat represents 60% of the total caloric requirements- by the mice for 16 weeks resulted in a significant increase in weight associated with insulin resistance manifested by a significant increase in plasma insulin levels, plasma glucose level and HOMA and also was associated with significant decrease in adiponectin receptors R1 and R2 expression in both liver and skeletal muscle on comparing them with the control group.
- On increasing the duration of consumption of high fat diet for 20, 22, and24 weeks there was no significant increase in the body weight or insulin resistant state regarding plasma insulin, plasma

glucose level and HOMA. Also there was non significant decrease in the expression of adiponectin receptors AdipoR1 and AdipoR2 in both liver and muscle on comparing them with the consumption of high fat diet for 16 weeks.

- Studying the effect of exercise training for 45 minutes /day for 4 weeks resulted in a significant improvement in the insulin resistance state regarding plasma insulin, plasma glucose and HOMA and also was associated with significant increase in expression of AdipoR1& AdipoR2 in both liver and skeletal muscles on comparing them with the same aged group only received high fat diet. However there was no significant weight loss in the exercised group.
- On increasing duration of exercise training for 6 weeks and moreover 8 weeks there was significant improvement in insulin resistance regarding plasma insulin level, plasma glucose and HOMA and also was associated with significant increase in the expression of AdipoR1 in liver, AdipoR1 and AdipoR2 in muscle, whereas liver AdipoR2 expression was significantly decreased on comparing them with the same aged group only received high fat diet. However also there was no significant weight loss in the exercised groups.
- By comparing the effect of exercise training for 4,6 and 8 weeks on insulin resistance and expression of adiponectin receptors there was non significant decrease in the insulin resistance regarding plasma glucose level , plasma insulin level and HOMA. Also there was non significant increase in the expression of AdipoR1, AdipoR2 in muscle, and AdipoR1 in liver, while AdipoR2 in liver showed non significant decrease.

From the above results we conclude that exercise training improves insulin sensitivity and up-regulates mRNA expression of AdipoR1 in both skeletal muscle and liver in mice and AdiopR2 in muscle and this suggest that the insulin sensitizing effect of exercise training may be mediated even partially through increased adiponectin receptor expression and up regulation of adiponectin receptors reaches certain level and increasing the duration of exercise adds no more improvement to insulin sensitivity or adiponectin receptor expression.

RECOMMENDATIONS

- Further studies on the effect of exercise training on insulin resistance to find out other mechanisms by which the exercise improves the insulin resistance.
- Further investigations are needed to find out the effect of longer durations of exercise training and whether this improvement would be reversed after stoppage of exercise.