

Investigating the efficacy of natural blood glucose lowering compounds in the prevention of congenital heart defects during maternal diabetes using the chick embryo

Batoul Haddad, Zainab El-hashmi

Supervised by: Dr. Huseyin C. Yalcin, Dr. Fatihah M. Benslimane, Hana A. Hussain

Abstract

Diabetes is a metabolic disorder that is characterized by hyperglycemia. Although there are several drugs available for diabetes, patients tend to follow natural remedies. However, the use of these natural remedies lacks scientific evidence of its effect. Therefore the aim of this project was to first identify the histological changes of the developing heart in a hyperglycemic environment. Secondly, test the efficacy of selected natural compounds in lowering blood glucose levels and to assess its gene expression changes.

Objectives

- To generate a hyperglycemic model using chick embryo as an animal model and assess its histological changes.
- Assess the efficacy of selected natural compounds in lowering blood glucose level and their effects on gene expression of specific cardiac markers.

Methodology

Pre-injection blood Glucose measurements:

Figure 1: Natural compounds used in this study. A. Teucrium polium. B. mixed herbs. C. Senegal Senegal. D. Compound X


Figure 4: Histology of the chick embryo heart at day 10. A. Control. B. Injected with D-glucose. RV: right ventricular, LV: left ventricular, RA: right atrium, LA: left atrium, IV septum: interventricular septum. Histological slide of heart injected with glucose and saline as a control, figure represent an over all reduction in the heart size.

Figure 5: Percentage of decrease in blood glucose level in all groups. Compound X acted as insulin in lowering blood glucose level at 2 and 4 hours. Compound C decreased blood glucose level after 2 hours only.

Figure 6: Gene expression studies. Compound X (P=0.0222) and compound B (P=0.0284) affected the relative gene expression of GLUT-1 and HIF1 by (P=0.0044) and (P=0.0001). However, other compounds did not cause any significant change in the other genes of interest.

Conclusion

Hyperglycemia leads to the decrease in cardiac function due to its effect on the cardiac structure. A compound obtained from the desert of Algeria and another mixture prepared in Qatar could be used to lower blood glucose levels in adults. However, they might not be suitable for the developing fetus.

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References
