Insulin resistance and oxidative stress in kidney and liver of senescent female rats

Almeida, B.Z.[1]; Seraphim, D.C.C.[1]; Punaro, G.R.[2]; Nascimento, M.A.[1]; Rodrigues, A.M.[2]; Mouro, M.G.[1]; Lanzoni, V.P.[3]; Lopes, G.S.[4]; **Higa, E.M.S.[1, 2]**

[1]Translational Medicine; [2]Nephrology Division; [3]Pathology Department; [4]Preventive Medicine, UNIFESP, Sao Paulo, Brazil

INTRODUCTION

The aging process is a complex phenomenon that promotes deleterious changes in cells and tissues, being responsible for the increased morbidity and mortality of the patients. Oxidative stress (OS) may occur under several conditions, such as changes in glucose levels; it is involved in the aging process, and may result in cellular damage, also contributing to insulin resistance (IR). Animals supplemented with fructose (F) have been used as a well-established experimental model of IR. The aim of this study was to verify the renal and hepatic oxidative stress of senescent rats, with insulin resistance induced by high fructose intake.

METHODS

We utilized female Wistar rats with 3 (young) or 22 (aged) months of age, allocated in 4 groups: YC (young control), YF (young fructose), SC (senescent control), and SF (senescent fructose); n= 4-8 for each group. The animals received standard chow (Purina®) *ad libitum*. The groups SC and YC received water; SF and YF received fructose 10% in drinking water, both *ad libitum*. After 12 weeks of supplementation with high fructose or vehicle (water), the animals were sacrificed by decapitation and blood, kidneys and liver were collected. In the blood we measured oxalacetic transaminase (GOT) and pyruvic transaminase (GPT). In the blood, kidneys and liver we measured nitric oxide (NO) by NOA™, a gold standard method and thiobarbituric acid reactive substances (TBARS) by colorimetric method, an indirect indicator of lipoperoxidation.

Results are expressed as mean ±SEM, analyzed by One Way ANOVA with Tukey´s Multiple Comparison post-test; significance for p<0.05.

RESULTS

For all figures:

YC: young control
YF: young fructose
SC: senescent control
SF: senescent fructose

Serum

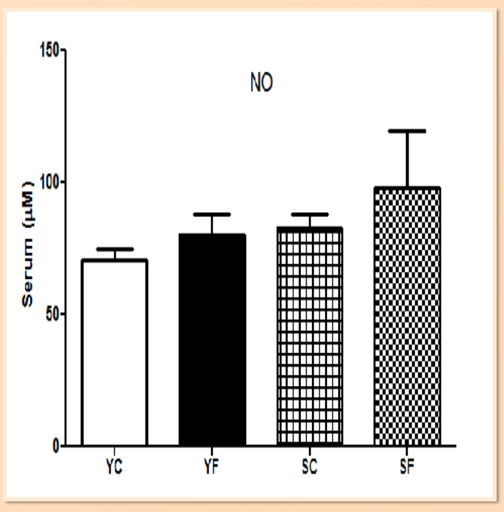

Figure 1. Serum NO levels after 13 weeks of fructose protocol. Data are given as mean ±SEM. n= 4; NS. NO=nitric oxide

Renal Tissue

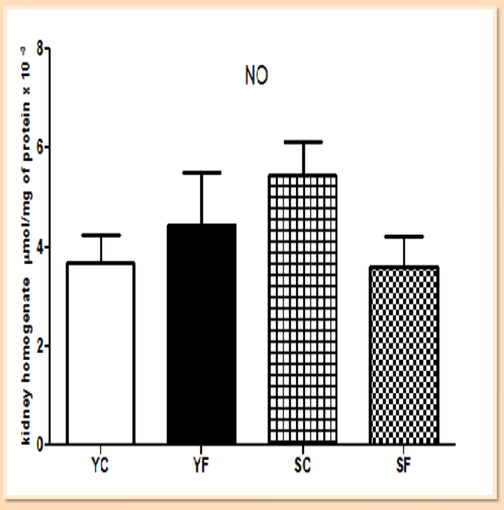

Figure 2. Renal NO levels after 13 weeks of fructose protocol. Data are given as mean ±SEM. n=4; NS. NO=nitric oxide

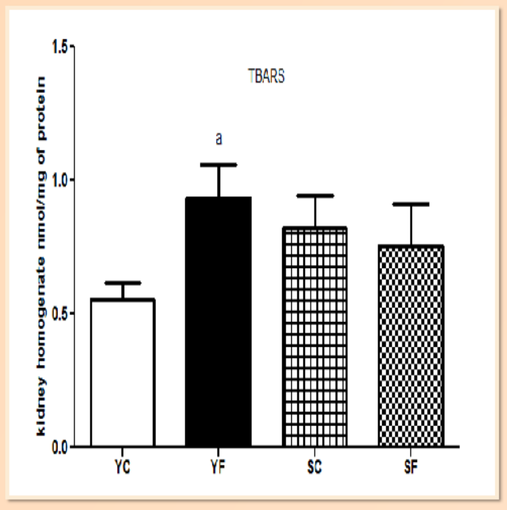

Figure 3. TBARS levels in kidney after 13 weeks of fructose protocol. Data are given as mean ±SEM. n=4. One Way ANOVA with Tukey´s Multiple Comparison post-test; p<0.05. [a]: vs YC. TBARS=thiobarbituric acid reactive substances

Hepatic Tissue

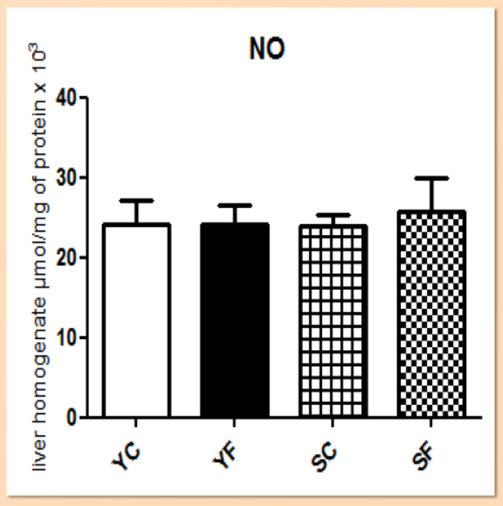

Figure 4. Hepatic NO levels after13 weeks of fructose protocol. Data are mean ±SEM. n= 8; NS. NO=nitric oxide

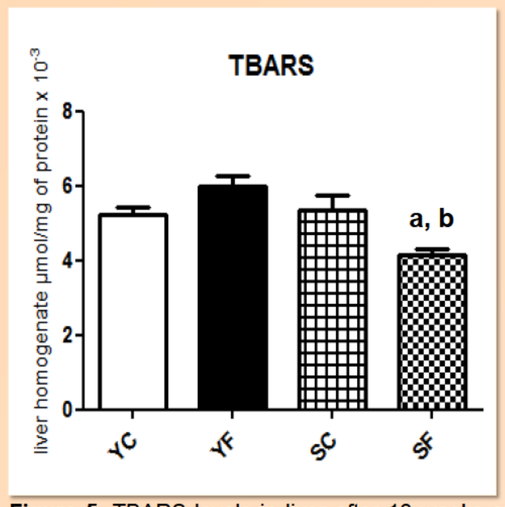

Figure 5. TBARS levels in liver after 13 weeks of fructose protocol. Data are given as mean±SEM. n=8. One Way ANOVA with Tukey´s Multiple Comparison post-test; p<0.05: [a] vs. YF; [b] vs. SC. TBARS=thiobarbituric acid reactive substance

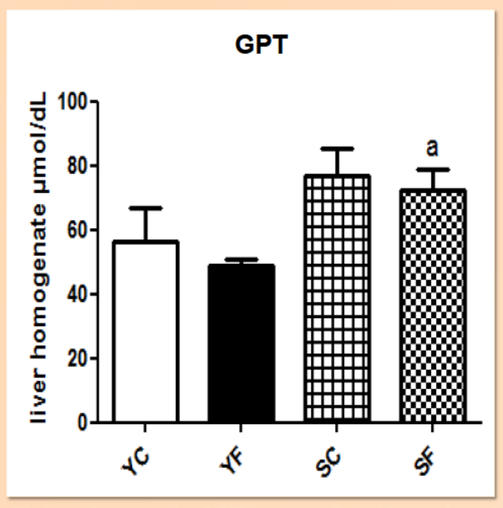

Figure 6. Hepatic GPT levels after 13 weeks of fructose protocol. Data are given as mean ±SEM. n= 4. One Way ANOVA with Tukey´s Multiple Comparison post-test; p<0.05; [a]: vs YF. GPT=pyruvic transaminase

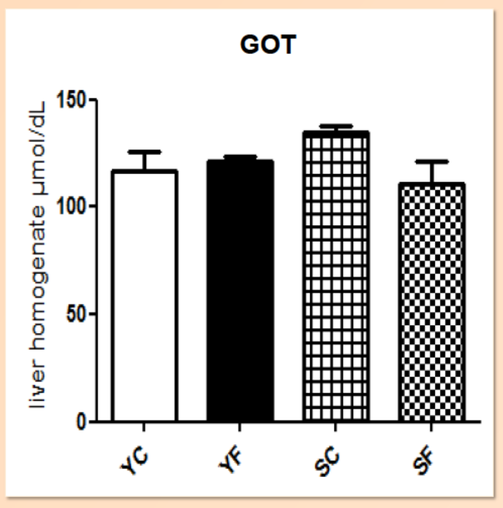

Figure 7. Hepatic GOT levels after 13 weeks of fructose protocol. Data are given as mean ±SEM. n= 4; NS. GOT=oxalacetic transaminase

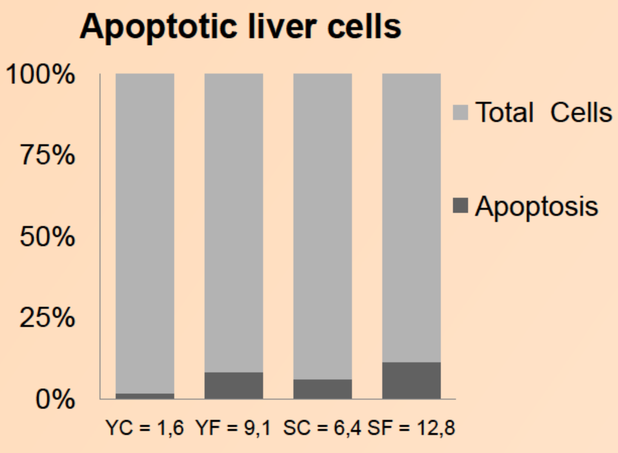

Figure 8. Percentage of liver apoptotic cells. n= 5 with 10 fields in each histological slide

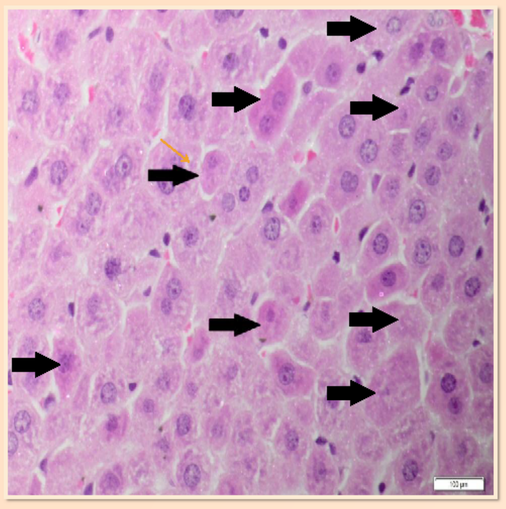

Figure 9. HE stain in liver slides. The arrows are showing apoptotic hepatocytes, represented by acidophilus corpuscles and retraction figures. Magnification with x400. HE=hematoxylin eosin

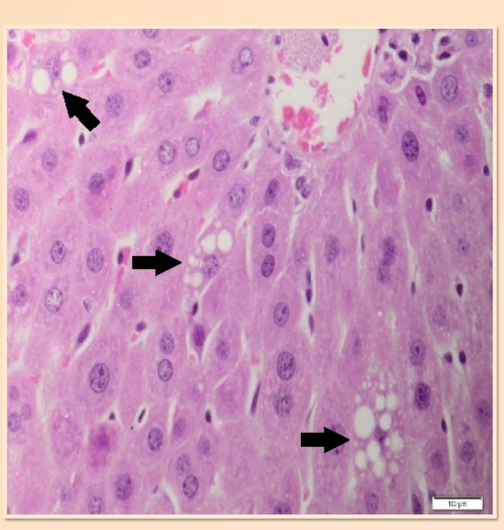

Figure 10. Histological section of liver presenting macro and microvesicular steatosis on rare liver cells (arrows). HE magnification x400. HE=hematoxylin eosin

Conclusions

In summary, our preliminary data showed that aged compared to young animals increased levels of hepatic apoptosis. Fructose also increased apoptosis in young and senescent animals.

Fructose administration increased lipoperoxidation in the kidneys of young female rats.

Further studies are necessary to monitore aging tissue damage and establish preventive measures against this process .

ACKNOWLEDGMENTS

Email:
biazocoler@hotmail.com
emshiga@unifesp.br

51ERA-EDTA
318--SP
I) Diabetes. I1) Basic research in diabetes.
Elisa Higa
DOI: 10.3252/pso.eu.51era.2014
Poster presented at: