Effects of steviol on cytotoxicity, adipogenesis, ROS concentration and gene expression in 3T3-L1 Cell Line

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The presented work is an integral part of the research project (National Science Centre, Poland, NCN 2017/27/B/NZ29/00677)

Background

The increasing prevalence of **diabetes mellitus has become one of the world's most serious public health problems**. This reflects an increase in associated risk factors such as being overweight or obese. Currently available therapies are associated with a number of adverse effects, so there is a need to search for new substances that can support the treatment.

Stevia rebaudiana Bertoni is a plant famous for its sweetness due to the content of steviol glycosides that are derivatives of diterpene – steviol. Stevia and its glycosides are becoming popular in the world of science due to their **anti-diabetic potential**. However, the mechanisms responsible for its action are not fully understood and require further investigation.

Study aim

The aim of this study was to evaluate the effects of steviol on adipogenesis, intracellular ROS generation and the gene expression, as well as cytotoxicity in murine 3T3-L1 cell line.

Methods

Cell viability, adipocyte differentiation, intracellular ROS generation and the influence on gene expression in the presence of steviol (in concentrations of 1 – 100 μM) was determined using MTT assay, Oil Red O staining, NBT methods and RT-PCR.
Murine cell line 3T3-L1 was obtained from the American Type Culture Collection (ATCC® CL-173™, USA).

Results

It was found that **steviol** in concentrations up to 100 μM **did not affect proliferation** of 3T3-L1 cells.
Also, there were **no effects on lipid accumulation and intracellular ROS generation** with examined concentrations (0 - 100 μM).

However, the **agent affected the expression of genes** regulating adipogenesis and lipogenesis processes:

PPARγ	(at concentrations of 10 and 100μM, by 38.1↓, 45.3%↓)
C/EBPα	(at concentrations of 1, 10 and 100μM, by 36.9↓, 61.9↓, 45.3%↓)
SREBP-1	(at concentrations of 10 and 100μM, by 49.8↓, 37.2%↓)
LPL	(at concentrations of 1, 10 and 100μM, by 45↓, 33.7↓, 30.8%↓)
aP2	(at concentrations of 1, 10 and 100μM, by 36.9↓, 23.8↓, 52.4%↓)
FAS	(at concentrations of 1, 10 and 100μM, by 55.4↓, 22.4↓, 55.6%↓)
LEP	(at concentrations of 1, 10 and 100μM, by 27.5↓, 59.2↓, 68.6%↓)
ADIPQ	(at concentrations of 1 and 100μM, by 35.3↑, 55.6%↓)
RSTN	(at concentrations of 1, 10 and 100μM, by 36.9↓, 61.9↓, 63.9%↓)
GLUT4	(at concentrations of 10 and 100μM, by 33.7↓, 37.2%↓)

Conclusion

The results of this study seem to confirm that **the mechanisms of anti-diabetic effects of steviol may be related to inhibition of expression of genes responsible for adipogenesis, lipogenesis and glucose transport in cells.**

References

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4. Kroyer, G. (2010). Stevioside and Stevia-sweetener in food: application, stability and interaction with food ingredients. Journal für Verbraucherschutz und Lebensmittelsicherheit, 5(2): 225–229.
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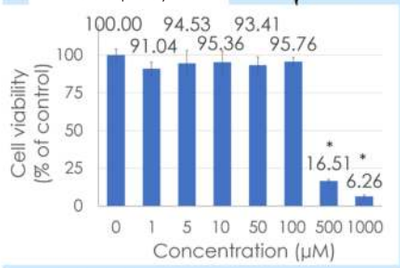
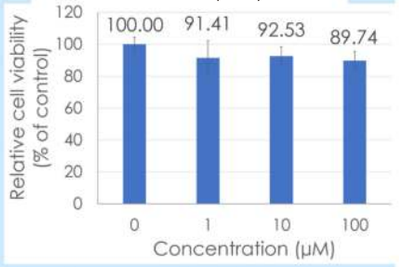
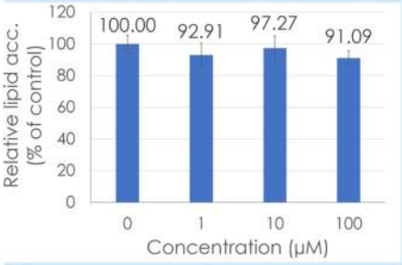
Graphs

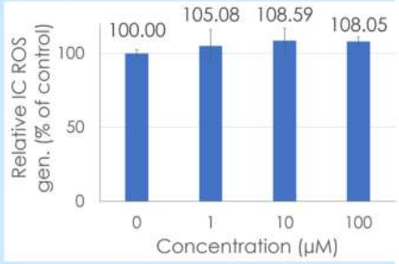
Preadipocytes

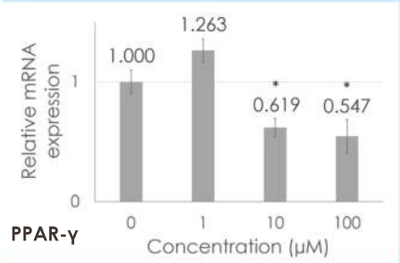


Differentiated adipocyte cells

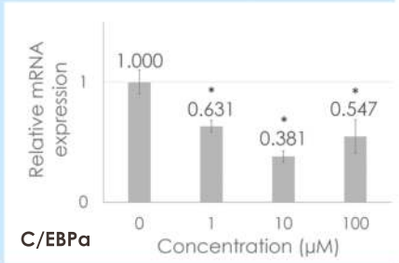




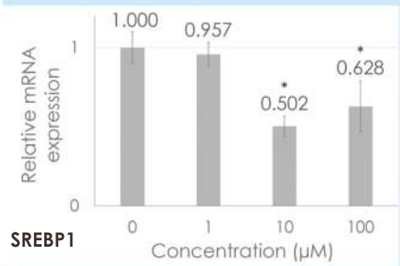




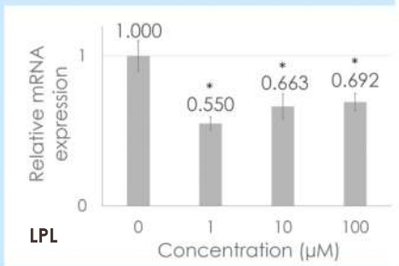
PPAR-γ



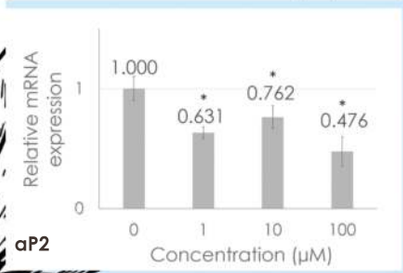
C/EBPa



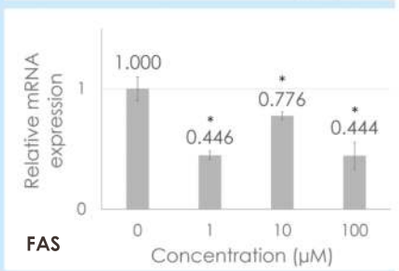
SREBP1



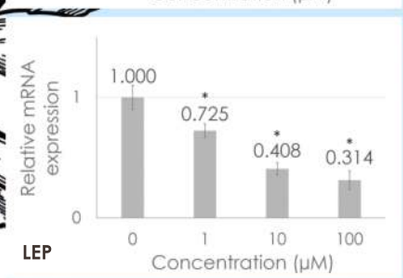
LPL



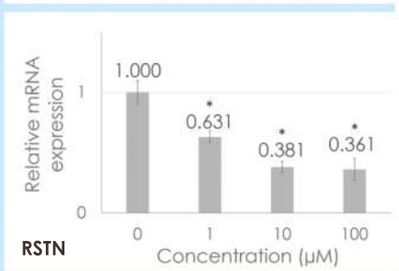
aP2



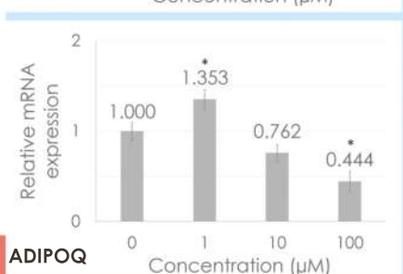
FAS



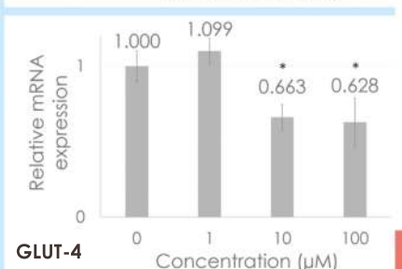
LEP



RSTN



ADIPOQ



GLUT-4