

Effect of high glucose on bone marrow stromal cell differentiation into osteoblasts or adipocytes

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BIOCHEMISTRY

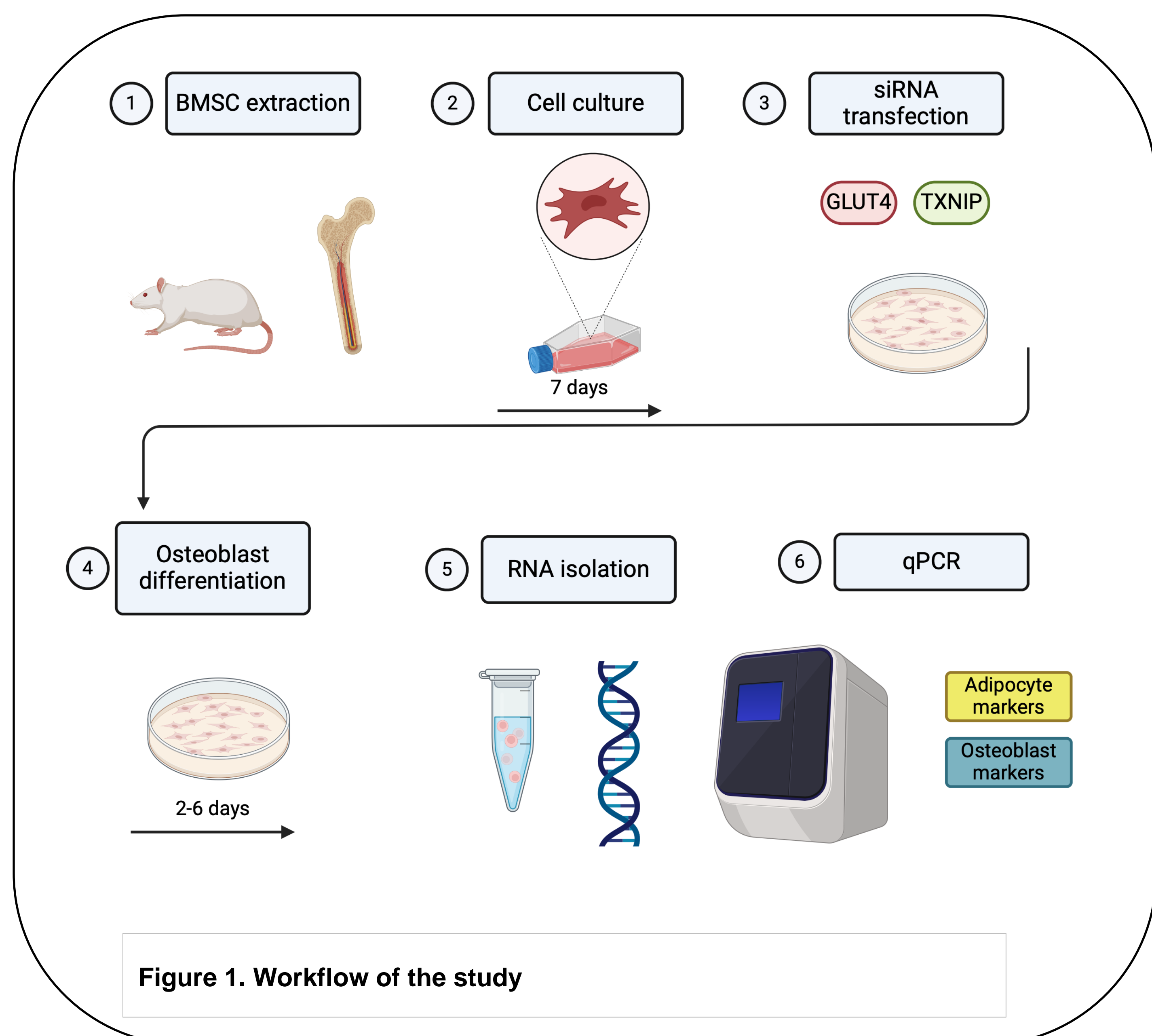
Introduction

Bone marrow stromal cells (BMSCs) can differentiate into bone-forming osteoblasts or fat-storing adipocytes. Glucose is necessary for the BMSC differentiation in which insulin-regulated glucose transporter protein 4 (GLUT4) has a key role. In type 2 diabetes (T2D), the function of GLUT4 is impaired due to insulin resistance. Thioredoxin-interacting protein (TXNIP) is a pro-inflammatory protein that promotes oxidative stress in the cell. Hyperglycemia that occurs in T2D is known to increase the expression of TXNIP and directs differentiation of BMSC more towards adipogenesis and decreases osteogenesis.

Aim of the study

The aim of the study was to investigate the effect of GLUT4 and TXNIP silencing on the differentiation of BMSCs, in a physiological (NG, 5.5 mM glucose) and hyperglycemic environment (HG, 25 mM glucose).

Materials and methods



GLUT4 silencing increased adipogenesis and decreased osteogenesis

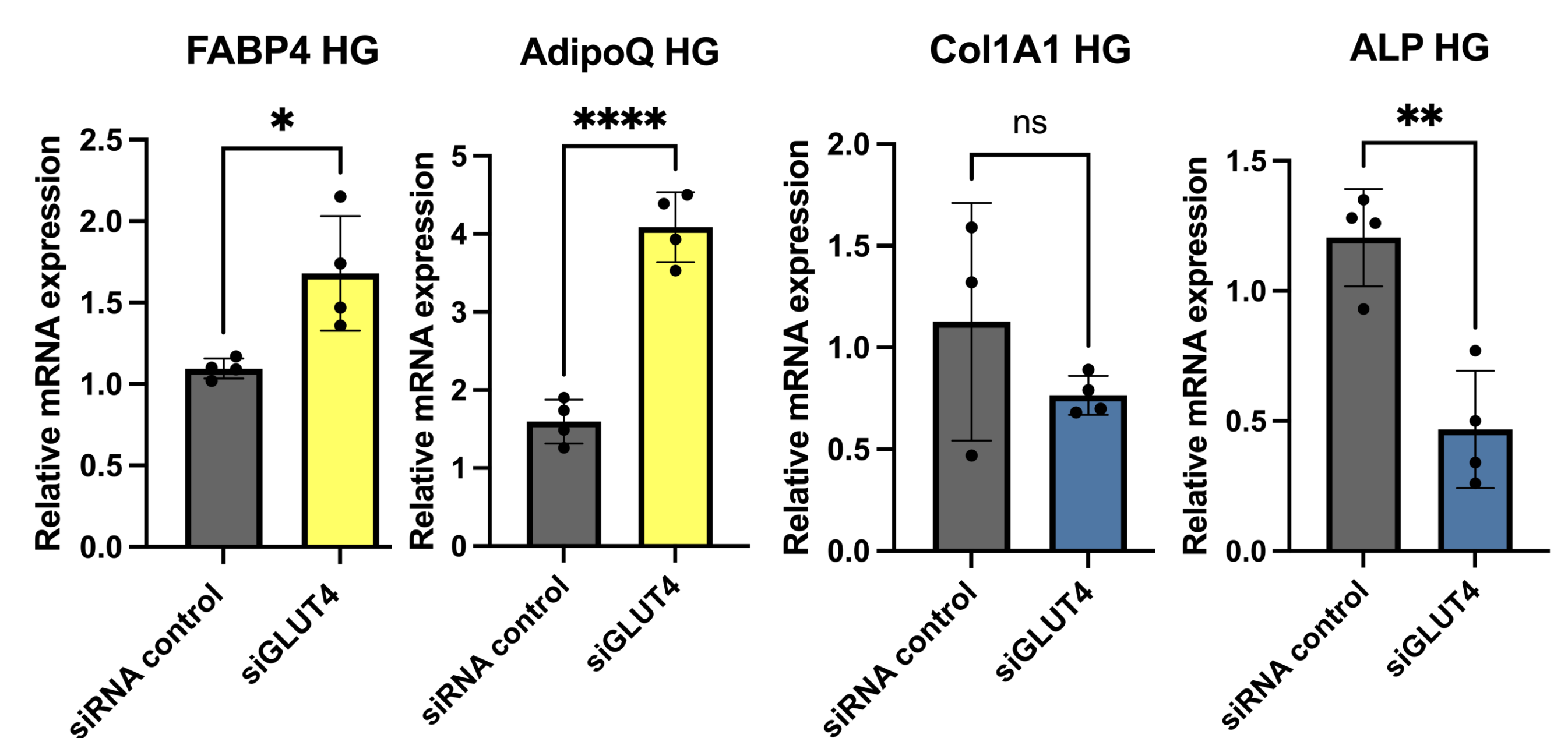


Figure 2. In hyperglycemic environment, GLUT4 silenced cells expressed more adipogenic markers (yellow) but less osteogenic markers (blue) despite growing in osteoblastogenic medium.

TXNIP silencing decreased both adipogenesis and osteogenesis

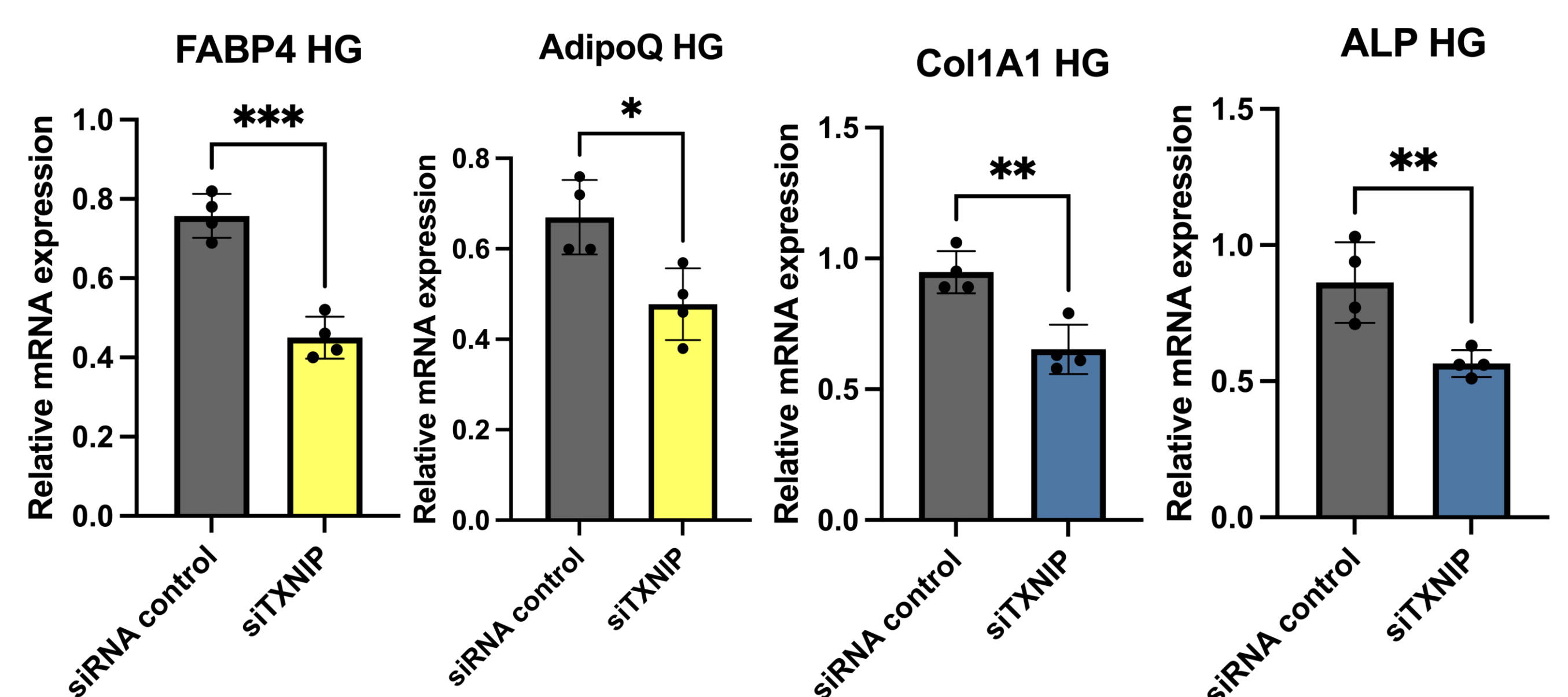


Figure 3. In hyperglycemic environment, TXNIP silencing decreased the expression of adipogenic (yellow) and osteogenic markers (blue) implicating that adipogenesis and osteogenesis are downregulated.

Conclusions

- Silencing of GLUT4 in hyperglycemic environment decreased the expression of osteogenic genes which may explain why diabetic bone marrow is more "fatty" and bones more fragile.
- TXNIP silenced cells expressed increased amount of GLUT4, which may indicate a link between the function of TXNIP and GLUT4.
- Further studies are needed to understand more deeply the role of TXNIP and GLUT4 in osteoblast differentiation.

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