

Presenting Author Name

Shirley Morris

Phonetic spelling of your (full) name

SHUR-lee MAWR-is

Presenting Author Category

Masters Student

Supervisor Name

Lei Xing

GBD Audio File

Shirley Morris CHRD GBD presentation.m4a

Headshot

Shirley Morris Headshot.jpg

Short Bio (100 words)

My name is Shirley Morris, and I recently completed my undergraduate honours research in Dr. Lei Xing's lab, investigating the effects of Growth Differentiation Factor 15 on the development of the human placenta, the results of which I am presenting here today. I have since begun my M.Sc. research with Dr. Xing, investigating the effects of cortisol on placental development and steroidogenesis, using trophoblast organoids and human samples. I also serve as the president of the Biological Sciences Graduate Students' Association and work as a grader/marker and invigilator. Outside of the university, I love watching movies, hiking, and knitting!

Research Category

Basic Science

Abstract Title

GDF15 deficiency decreases the proliferative abilities of placental stem cells

Authors

Name	Role	Profession
Shirley Morris	Presenting Author	Student
Lei Xing	Co Author	Assistant Professor

Background

The placenta, a critically understudied organ, significantly impacts the health of the mother and fetus during pregnancy. Formed mainly from cytotrophoblast (CT) stem cells and differentiated syncytiotrophoblast (ST) cells, the placental villous tissue produces developmental signalling molecules, including Growth Differentiation Factor 15 (GDF15), whose role during pregnancy remains largely unknown.

Objective

In this study, we aim to understand how GDF15 impacts the proliferation and differentiation of placental stem cells, as well as the cellular composition of the developing placenta.

Methods

We used a CRISPR-mediated approach to generate GDF15-knockout trophoblast stem cell lines (CT29) and established trophoblast organoid cultures. We performed an EdU-based assay to evaluate the proliferative abilities of GDF15-knockout, KO; heterozygous, GDF15+/-; and mock-edited (wild-type, WT) control CT29 cells in the absence and presence of recombinant GDF15 protein. Immunofluorescence was used to quantify the ratio of different cell types in trophoblast organoids generated using our CT29 cells of different genotypes. Student's t-tests, ANOVA tests, or non-parametric tests were performed to analyze statistical significance.

Results

The EdU assay showed that 44.16% of WT cells (n=7), 0.39% of KO cells (n=9), and 13.22% of KO+GDF15 cells (n=12) were EdU-positive and thus proliferating. These differences ($p \leq 0.0001$) suggest that GDF15 maintains proliferation in CT29 cells. GDF15KO organoids were smaller and grew more slowly compared to WT organoids, in line with growth curves from three KO, one GDF15+/-, and two WT cell clones grown in monolayer culture. GDF15KO organoids (n=4) had proportionally more ST cells ($p=0.0148$) and fewer CT cells ($p=0.0547$) compared to WT organoids (n=6). Larger sample sizes would strengthen these findings.

Conclusion

GDF15 deficiency hinders placental stem cell proliferation, which can be rescued by GDF15 supplementation, and impacts the ratio of CT-to-ST cells in trophoblast organoids by promoting ST cell differentiation. This could lead to the premature depletion of placental stem cells and pregnancy complications.