

Comparison of placental morphology and glycosylation patterns of proteins between normal pregnancy and IUGR a pilot study

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Background

Intrauterine growth restriction (IUGR) neonates have significantly lower birthweight, length and ponderal index. These measures of neonatal nutritional status are indicators of decreased placental function.

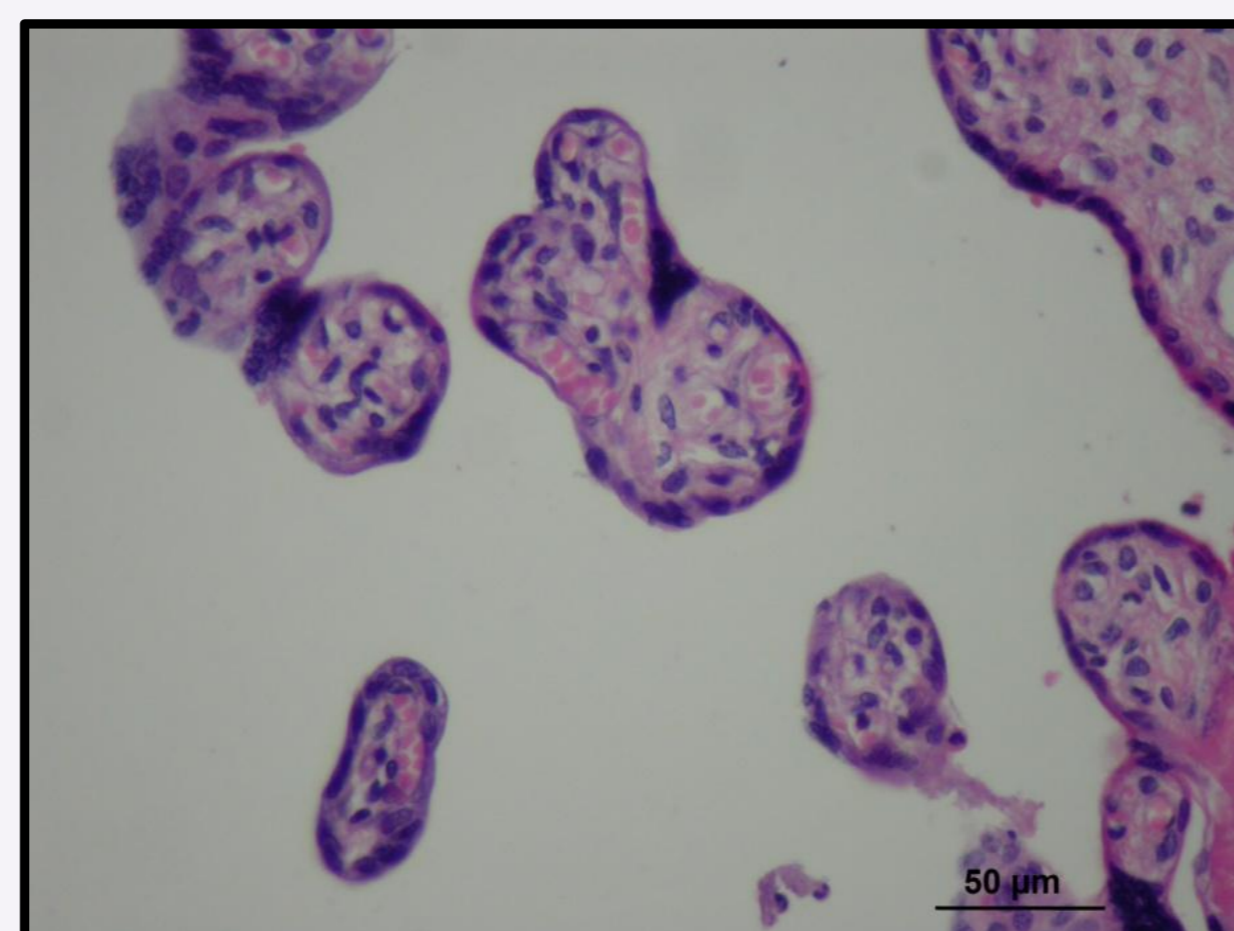
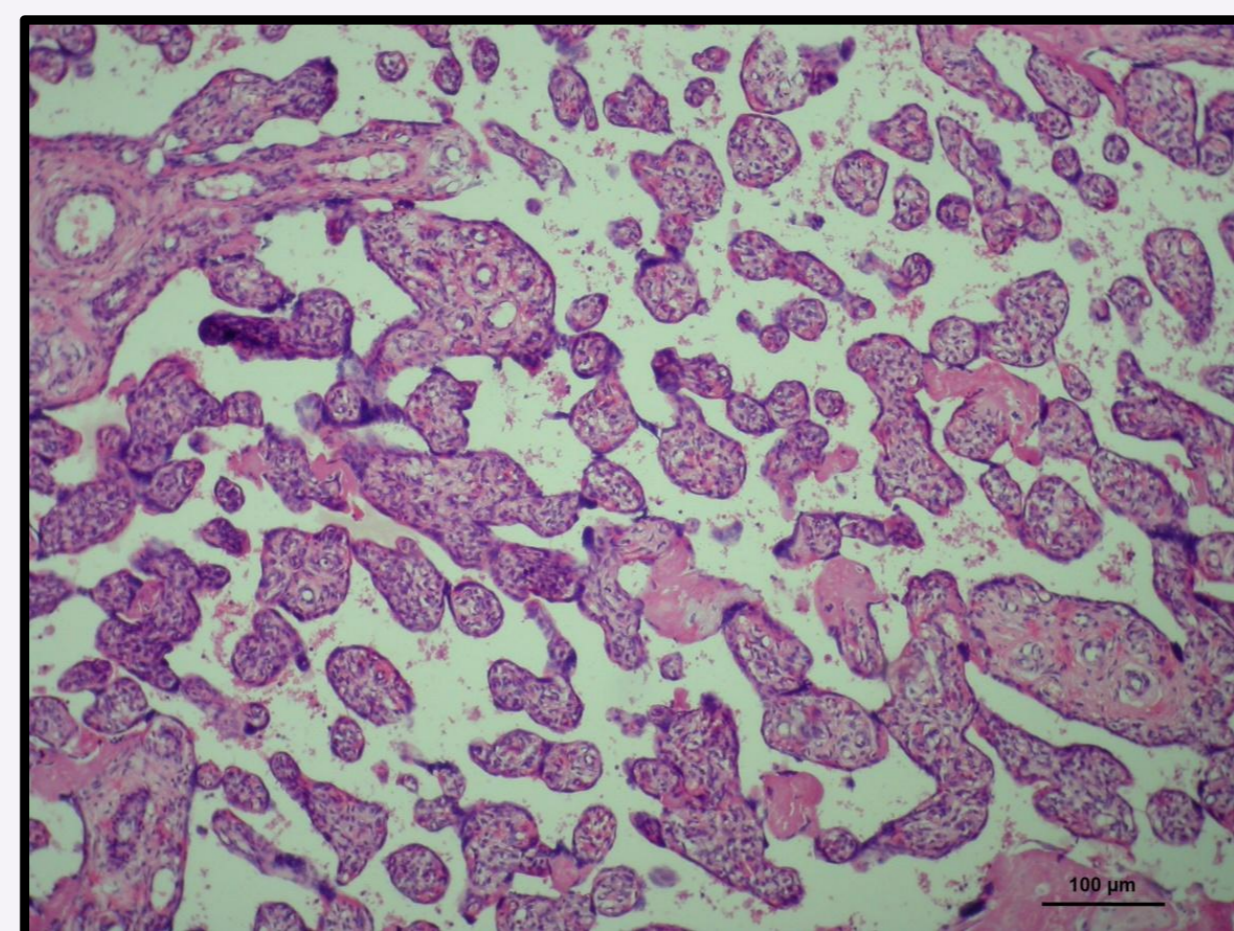
IUGR fetuses have 10 to 20 times higher perinatal mortality rate than the appropriate-for-gestational age (AGA) fetuses [1]. Furthermore, IUGR provides a significant risk for potential adult diseases, e.g. diabetes type 2, coronary artery disease and hypertension [2].

Objective

Terminal villi of human placenta were studied by stereological methods [3]. Our hypothesis is that quantitative differences in mesenchyme of terminal villi reflect the differences in glycoprotein structure.

Further study of glycosylation pattern may be helpful in characterisation of molecular differences between IUGR and normal placentas [4].

Control
N=5

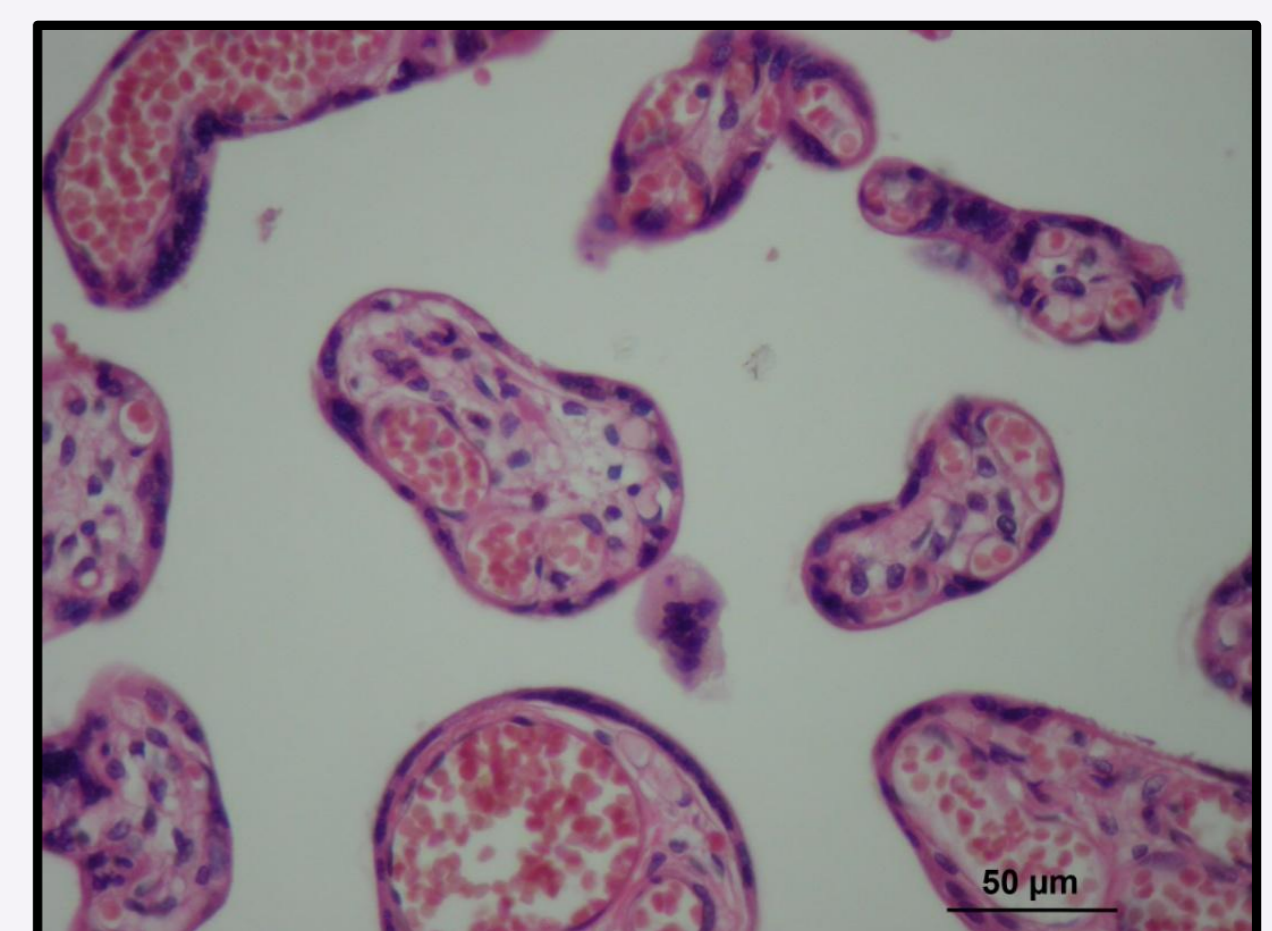
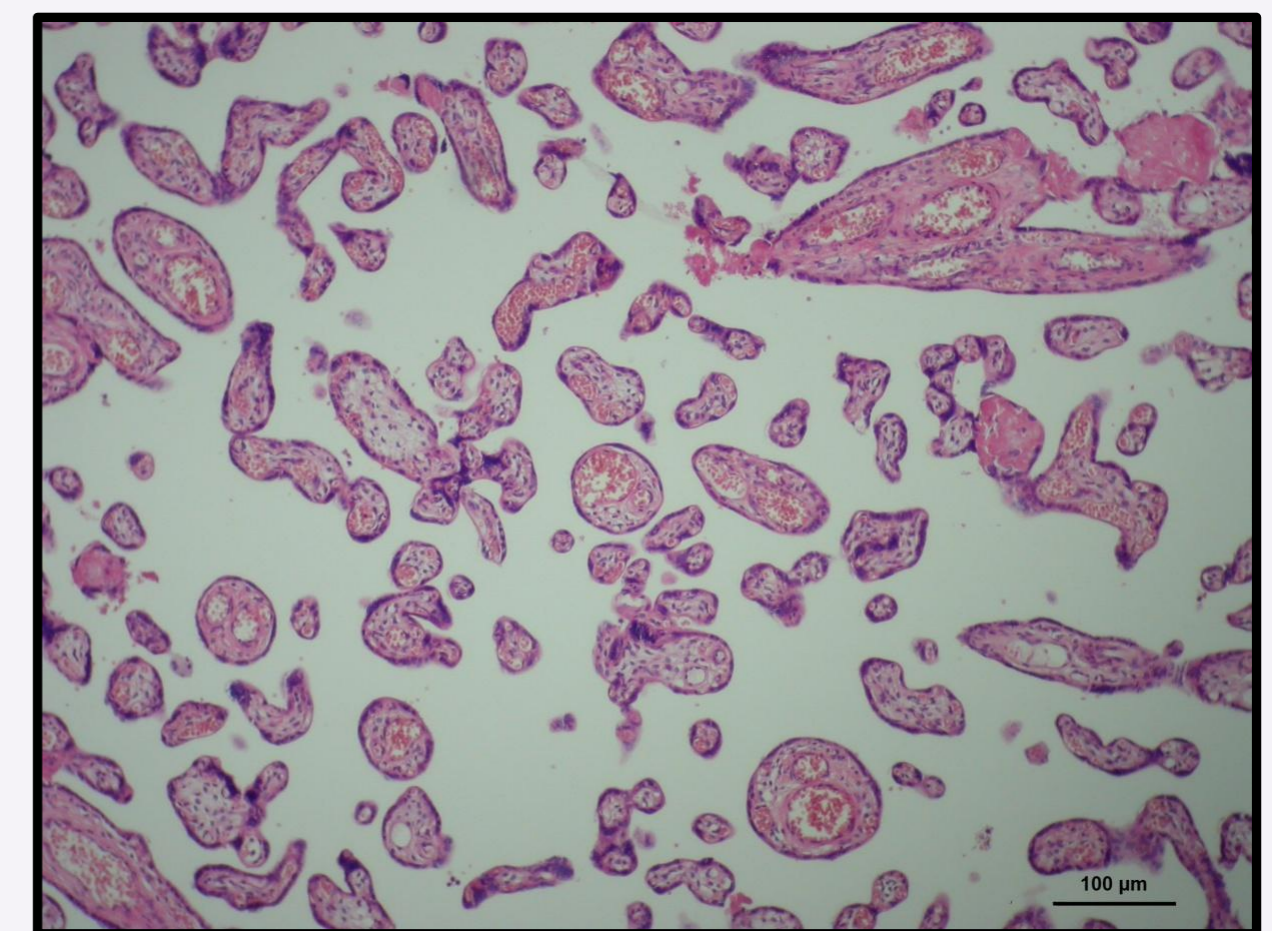


Stereologic measurements on terminal villi (TV) of human placenta

All measured parameters were significantly smaller in IUGR group:

- absolute volume of TV ($p < 0.05$)
- volume of mesenchyme of TV ($p < 0.01$)
- surface area of TV ($p < 0.05$)
- surface area of trophoblast of TV ($p < 0.01$)
- surface area of mesenchyme of TV ($p < 0.01$)
- surface area of blood vessels of TV ($p < 0.05$)

IUGR
N=5



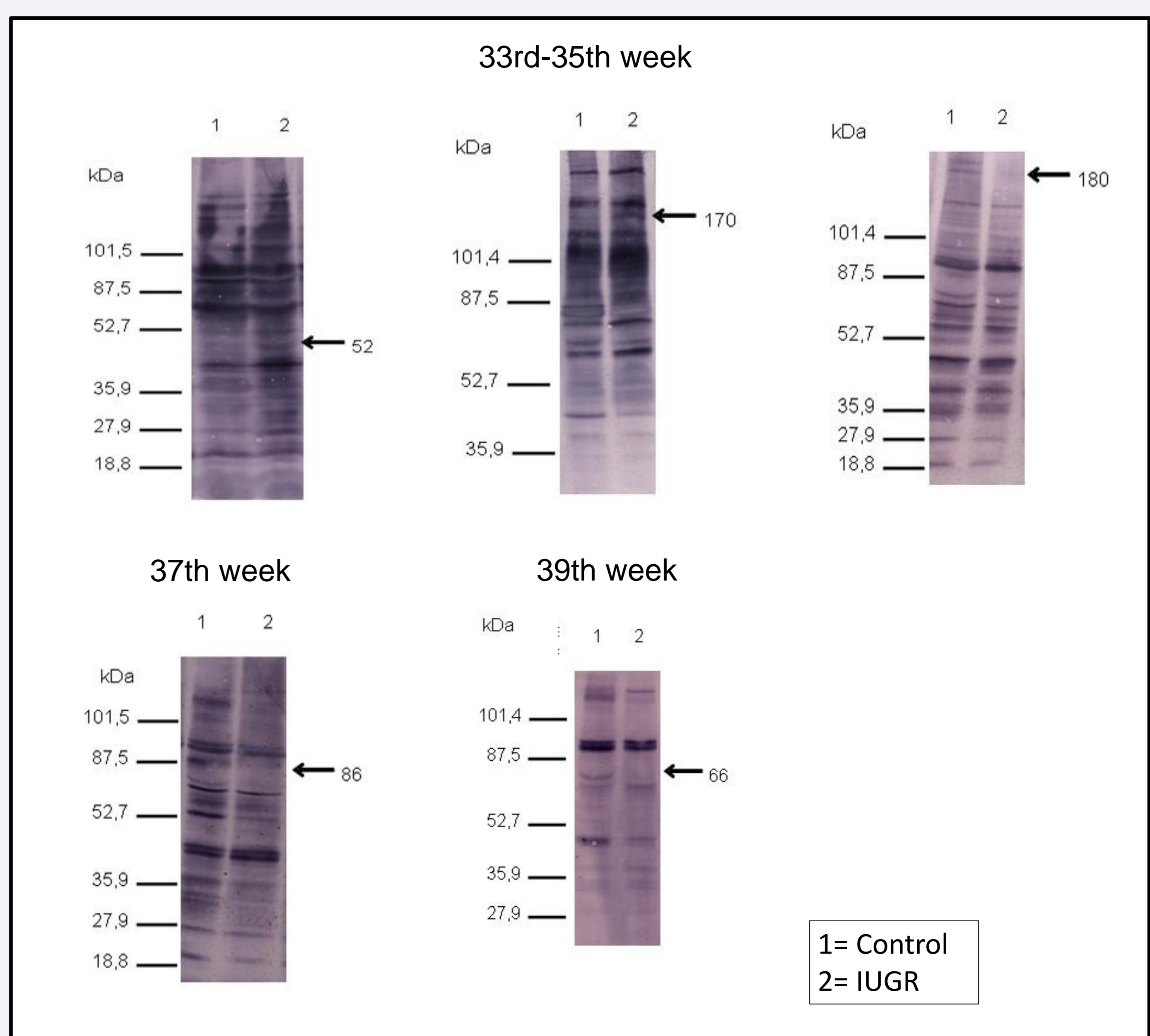
Western blot analysis

Tissues of 7 normal and 11 pathological placentas (IUGR) were homogenized and concentrations of proteins were estimated. Oligosaccharide branches were detected by Western-blot using lectins: SNA, DBA, UEA-I and PHA-E, after discontinuous SDS-PAGE.

Expressed glycoprotein	Detection with lectin	Expressed in group	Gestational week
GP52	SNA	IUGR	33rd-35th
GP170	PHA-E	IUGR	33rd-35th
GP180	DBA	Control	33rd-35th
GP86	DBA	Control	37th
GP66	UEA-I	Control	39th

Conclusion

Our results support the hypothesis that oligosaccharide structures of glycoproteins play crucial role during placental development. Further molecular investigation may clarify connection between glycoproteins of terminal villi and fetal growth.



References

1. U.S. Das, G.D., *Pediatr Clin N Am* **51** (2004) p639; 2. Z. Fan et al., *Ann Med.* **42** (2010) p596.; 3. T.M. Mayhew et al., *Placenta* **24** (2003) p219; 4. E. Sgambati et al., *Placenta* **23** (2002) p503.