Preeclampsia and Inflammatory Preterm Labor Alter the Human Placental Hematopoietic Niche.

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Public Summary:
BACKGROUND: The human placenta is a source of hematopoietic stem and progenitor cells (HSPCs). The RUNX1 transcription factor is required for the formation of functional HSPCs. The impact of preeclampsia (PE) and preterm labor (PTL, spontaneous preterm labor [sPTL] and inflammatory preterm labor [iPTL]) on HSPC localization and RUNX1 expression in the human placenta is unknown. METHODS: We compared the frequency and density of HSPC in control samples from sPTL (n = 6) versus PE (n = 6) and iPTL (n = 6). We examined RUNX1 protein and RNA expression in placentas from normal pregnancies (5-22 weeks, n = 8 total) and in placentas from the aforementioned pregnancy complications (n = 5/group). RESULTS: Hematopoietic stem and progenitor cells were rare cell types, associated predominantly with the vasculature of placental villi. The HSPC density was greater in the chorionic plate (CP) compared to the villi ($P < .001$) and greater in PE and iPTL samples as compared to controls within the CP (not significant) and overall ($P < .05$). During the fetal period, RUNX1 was expressed in the mesenchyme of the CP and villi. Inflammatory PTL samples were more likely to exhibit intraluminal RUNX1+ cell populations ($P < .001$) and RUNX1+ cell clusters attached to arterial endothelial cells. CONCLUSION: Placental HSPCs likely arise from hematopoietic niches comprised RUNX1+ mesenchyme and vascular endothelium. Pregnancy complications that result in preterm birth differentially affect placental HSPC localization and RUNX1 expression. Our results support previous findings that inflammation positively regulates hematopoiesis. We present new evidence that hemogenic endothelium may be active at later stages of human fetal development in the context of inflammation.

Scientific Abstract:
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