Making sense of preeclampsia where it begins : In the placenta

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On an overcast July afternoon in 1998, I was born preterm. As I gasped for air, my mom's relief was punctured by the weight of the midwife's elbow digging into her stomach. The organ that had nourished and protected me over the last 7 months—was yet to meet the world. I'm talking about the placenta.

The placenta is rooted into the wall of the womb like a tree in the soil, and it joins the baby through the umbilical cord. Blood vessels in the wall of the womb grow into the placenta, like roots, holding it firmly in place. When these blood vessels are too narrow, as in the top of my slide, the amount of blood flowing from the parent to the placenta is not enough to provide the baby with sufficient oxygen and nutrients. In response, the placenta rings the alarm that something is wrong by releasing molecules into the parent's bloodstream that trigger the pregnancy complication we know as preeclampsia.

Preeclampsia affects one in ten pregnancies worldwide, and it puts both the baby and the parent's health at risk. The baby's growth is compromised, while the parent suffers from high blood pressure and damage to many organs. The only cure for preeclampsia is delivering the baby, which often means inducing birth early. So, how can we help these affected parents and their babies?

One of the main difficulties in treating preeclampsia is its diverse nature. Think of a bag of skittles —it's the same candy, but different colors. People with preeclampsia have some common symptoms, but with very different severities and outcomes. Similarly, placentas that develop preeclampsia early compared to later in pregnancy are also very different; not only are at first glance and under a microscope, but also in their DNA. This suggests that there are different subtypes of preeclampsia: with different severities, outcomes, and the subject of my investigation: different DNA patterns.

My thesis work involves trying to define subtypes of preeclampsia according to their DNA patterns in the placenta. To do this, we first collect placentas with and without preeclampsia generously donated by parents after birth. Then, we measure tens of thousands of their DNA patterns, which give us clues about the health of a pregnancy. We also collect clinical information, like how much the baby weighed at birth, or in what week of pregnancy they were born. Using the clinical information and DNA data from 300 placentas, I'm working on creating a set of criteria that allows us to differentiate placentas with severe preeclampsia from those with other subtypes or without preeclampsia. Think of severe preeclampsia as the red skittles. To be able to separate them from the other colors without looking, you have to know which taste is unique to them.

Similarly, if we know which DNA patterns characterize severe preeclampsia, we may be able to detect it before symptoms appear. This is also the first step in further studying, and eventually treating, this serious type of the disease. The more we understand about the role of the

placenta in health and disease, the better care we will be able to provide for parents and their babies.