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NEWS RELEASE

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Researchers find a way to deliver drugs to the placenta to support healthier pregnancies

Discovery provides proof of principle for safe, targeted delivery of drugs to the placenta to improve pregnancy outcomes

La Jolla, Calif., May 6, 2016 (EMBARGOED until May 6, 11am PST) — Nearly 10 percent of babies born in the United States are born premature, according to the March of Dimes. The underlying cause of many complications during pregnancy is often a poorly functioning placenta, the organ that nourishes and maintains the fetus.

A new study by an international team of researchers, including Erkki Ruoslahti, Ph.D., distinguished professor at Sanford Burnham Prebys Medical Discovery Institute's (SBP) NCI-Designated Cancer Center, and adjunct professor at the Center for Nanomedicine and Department of Molecular, Cellular, and Developmental Biology, UC Santa Barbara, has found a way to selectively deliver drugs to the placenta without harming the fetus.

The discovery could one day help prevent some premature births and treat complications such as preeclampsia, a condition characterized by high blood pressure and sometimes, fluid retention. The study appears today in the journal *Science Advances*.

"Our findings emphasize the similarities between placentas and tumors," said Ruoslahti. The scientists demonstrated that two peptides – chains of amino acids – originally used to target tumors selectively, will perform the same function on a placenta, delivering drugs which improve placental function and benefit the growing baby without causing it harm. "That similarity makes it possible to use existing tumor-homing peptides. This paper shows that this strategy increases the delivery of drugs into the placenta," he added.

Many pregnancy complications are the result of the placenta not growing or functioning properly, but currently there are no drugs that can be used to treat those problems. Instead, doctors have to induce early delivery, which puts the infant at increased risk of developing infections and cerebral palsy in the short term and heart disease and diabetes later in life. This new research has the potential to avoid these problems by treating the baby in utero, thereby avoiding induced labor.

"Placentas behave like well-controlled tumors," said lead author Lynda Harris, Ph.D., of the University of Manchester in the UK. "They grow quickly, produce growth hormones and evade the immune system. A lot of cancer research focuses on finding ways of delivering drugs to kill the tumor without affecting the rest of the body. We had the idea that if we could selectively

target the placenta in the same way, we could deliver other drugs to help improve placental function and therefore treat pregnancy complications."

Using a mouse model, the researchers delivered a growth hormone to the placenta via peptide-coated nanoparticles. The drug had no effect on normal-sized fetuses but caused undersized ones to grow.

The targeted drug did not build up in the mother mouse's organs, and there were no levels detected in the mouse fetuses, suggesting that this method has the potential to one day be used in humans. The possibility of potential harmful effects still exists for mothers who have undiagnosed cancers because the drugs also target their tumors, but a screening program could overcome this problem.

"Only one drug for use during pregnancy has been licensed in the last 20 years," Harris said. "By developing this platform we have opened up the possibility that any number of new drugs can be adapted and then used safely to treat common and serious pregnancy complications."

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