

Uterine cells produce their own estrogen during pregnancy

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Doctoral student Amrita Das (left), with veterinary biosciences professor Indrani Bagchi and molecular and integrative physiology professor Milan Bagchi, discovered that uterine cells synthesize estrogen during pregnancy. Credit: Photo by Diana Yates, U. of I. News Bureau

For decades, scientists assumed that the ovary alone produced steroid hormones during pregnancy. In a new study in mice, however, researchers demonstrate that once an embryo attaches to the uterine wall, the uterus itself actually synthesizes the estrogen needed to sustain the pregnancy.

This is the first time that the [uterus](#) has been identified as an endocrine organ, said University of Illinois veterinary biosciences professor Indrani Bagchi, who led the study with doctoral student Amrita Das. Their findings appear this week in the [Proceedings of the National Academy of Sciences](#).

"It's the local [estrogen](#) that's critical in maintaining the growth of blood vessels within the uterus," Das said. After an embryo implants, the researchers found, this locally produced estrogen acts in concert with [progesterone](#) secreted from the ovaries to spur the differentiation of uterine stromal cells, a process called decidualization, and promotes the growth of blood vessels that support the development of the embryo.

The researchers discovered that during decidualization, mouse uterine stromal cells increase their expression of P450 aromatase, a key enzyme that acts with other enzymes to convert androgens to estrogen.

Even in pregnant mice that have had their ovaries removed, the production of uterine estrogen is able to support the growth and differentiation of the tissue and [blood vessels](#) needed to sustain the pregnancy.

Progesterone supplementation is required, however, indicating that local estrogen alone is not sufficient to maintain pregnancy.

Blocking the activity of the aromatase with an inhibitor also blocked decidualization, the researchers found, another indication that a successful pregnancy relies on estrogen production in uterine cells.

There are advantages to producing the appropriate amount of estrogen right where it is needed, rather than relying on the ovaries, Bagchi said.

"During pregnancy, the ovaries would need to secrete a high level of estrogen to ensure that the right amount of estrogen is present in the uterus to support decidualization," she said. "You can imagine that if the estrogen level goes high systemically, it could have a deleterious effect on pregnancy itself by antagonizing the progesterone action."

The findings may also be helpful to the study of endometriosis, said molecular and integrative physiology professor Milan Bagchi, an author

on the study. This disorder involves the growth of endometrial tissue, which is normally shed during menstruation, at sites outside the uterus, such as the peritoneal cavity and ovaries, producing painful lesions.

Endometriosis is spurred, in part, by unusually high levels of estrogen secreted from endometrial tissue growing at these extrauterine sites, he said.

Except during [pregnancy](#), "a normal cycling uterus does not make estrogen," he said. High estrogen levels block the activity of progesterone and can cause the non-cancerous growth of tissue seen in endometriosis.

Source: University of Illinois at Urbana-Champaign ([news](#) : [web](#))

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