Researchers look to imprinted genes for clues to fetal growth restriction in cloned swine

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(PhysOrg.com) -- Researchers at North Carolina State University have found that intrauterine growth restriction (IUGR), which results in low birth weight and long-term deleterious health effects in cloned swine, is linked to a type of gene - known as an imprinted gene - found only in placental mammals. Imprinted genes play an important role in the normal fetal development of all mammals, and this study could have future implications for the study of IUGR in humans.

Of the 20,000-25,000 genes in the human body, fewer than one percent, or about 100-200 genes, are "imprinted." Most genes contain a copy of both the mother's and the father's genetic information, and express proteins from both copies. Imprinted genes only make proteins from either the copy of the mother or the father. This family of genes is typically found in placental mammals, and has been linked to the flow of nutrients between the mother and the fetus.

"The theory is that paternally expressed genes extract resources from the mother in favor of the fetus, and that maternally expressed genes protect the mother from having too many resources taken away," says Dr. Jorge Piedrahita, professor of genomics at NC State. "As long as the balance is kept, everything is fine, but if one set of genes isn't working well, the offspring's size and health are affected. In the case of cloned pigs, we see a high incidence of intrauterine growth restriction, and these offspring do not do well."

Although cloned pigs have an unusually high incidence of IUGR, in

other cloned mammals, such as cattle, the opposite effect occurs and the offspring tend to be too large. Since the cloning process is the same regardless of species, Piedrahita and colleagues from NC State and the U.S. Department of Agriculture set out to discover what could account for these differences in offspring sizes, and found three genes that are imprinted differently in the pig. The researchers hope that these genes can provide the key to the way imprinted genes affect fetal growth, and help them to explain what goes wrong during the cloning process.

Their findings are published in the July issue of *Biology of Reproduction*.

"We want to know why the response to cloning is so different for each animal species, and these pig-specific genes give us a starting point for this work," Piedrahita says. "Hopefully if we can discover the ways in which these genes help regulate the flow of resources to the fetus, we can find a way to correct problems when they occur and eliminate IUGR in clones."

Source: North Carolina State University (news : web)