

# Father's Day Gift? Special Packaging for Genes in Sperm

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(PhysOrg.com) -- It was long believed that conception does not involve a meeting of equals. The egg is a relatively large, impressive biological factory compared with the tiny sperm, which delivers to the egg one copy of the father's genes. However, a new study from Huntsman Cancer Institute (HCI) at the University of Utah reveals that the father's sperm delivers much more complex genetic material than previously thought. The findings could lead to a diagnostic test to help couples deal with infertility.

Researchers discovered particular genes packaged in a special way within the sperm, and that may promote the development of the fetus.

"Our findings show that the father plays an active role in packaging his genome to help ensure a healthy baby," says study co-leader Brad Cairns, Ph.D., investigator with HCI and the Howard Hughes Medical Institute, and professor of oncological sciences at the University of Utah.

"However, they also raise the possibility that a man's aging, health and lifestyle may alter this packaging and negatively affect fertility and embryo development."

During fetal development, certain genes make decisions about organ and tissue development. The new research shows that in sperm, these genes are wrapped in special packaging materials called 'modified histones.' These modified histones appear to be key factors in ensuring genes are activated or repressed at the right level, place and time, which helps the fertilized egg develop properly.

Chromosomes are long strands of DNA containing thousands of genes, and their packaging helps determine which genes turn on and off. Understanding how these genes are activated or repressed leads to a better understanding of how disorders like birth defects and cancer develop.

"Genes have on-and-off switches, and understanding them allows us to target them, leading to possible treatments, cures or prevention strategies," says Cairns. "That's the good news."

The study is set for publication in the online edition of the journal *Nature*. The research involved collaboration between Cairns' lab at HCI and the University of Utah's in vitro fertilization (IVF) and andrology lab led by Doug Carrell - along with their joint graduate student, Sue Hammoud.

An implication of this study is that factors such as genetic mutations, age or lifestyle may affect sperm chromosome packaging, leading to infertility. "We are hopeful that this work will soon lead to a clinical diagnostic test that will help couples with infertility problems make better informed decisions regarding their prospects for a healthy child. We will also be testing if aspects of a man's lifestyle - such as age, diet or health - affect proper packaging and fertility," says Cairns. Other future work includes how decision-making genes are packaged in eggs, which remains a major mystery.

Source: Huntsman Cancer Institute

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