Researcher explain how embryo fights retroviral infection

June 24 2010

Some viruses insert themselves into the host's DNA during infection in a process called retroviral integration, causing several diseases, including AIDS and cancer, notes a Texas A&M researcher who specializes in fetal diseases. However, stem cells that give rise to the early embryo and yolk sac fight back, inhibiting further infection by aggressively silencing the invading viral DNA, says Michael Golding of the Department of Veterinary Physiology and Pharmacology.

The work of the researcher was recently published in *Cell Stem Cell*.

Early mammalian embryos actually possess three stem cell lineages: ES (embryonic stem), TS (trophectoderm stem), and XEN (extraembryonic endoderm), which give rise to the fetus, placenta and yolk sac respectively, the Texas A&M researcher explains. Using the mouse as a model organism, Golding and his colleagues demonstrate that the mechanisms silencing gene expression are different between each of the three stem cell types.

"Much like a closed book cannot be read while an open book can, the DNA encoding genes can either be tightly wound up and silent or in a relaxed, open, active state," Golding explains. "The mechanisms that control this gene packaging are called epigenetic as they represent a level of regulation that is above or 'epi' to genetics."

The study shows "retroviral silencing in XEN cells is epigenetic in origin" and that "the three cell lineages of early mammalian embryo have

vastly different viral silencing strategies as well as different capacities to suppress retroviral activity."

To examine the validity of a common assumption that these stem cells use similar mechanisms to silence retroviruses, Golding infected the mouse embryo stem cells with mouse leukemia virus (MLV) and monitored the virus' activity.

ES cells showed a progressive decline in virus activity, while TS cells had a constant level of virus activity. XEN cells, however, exhibited extremely aggressive and rapid silencing of virus activity, according to the study.

"Epigenetics is an exciting new field of research which is altering the way we think about fetal nutrition and exposure to environmental chemicals," Golding adds. "This discovery that all three stem cell types of the early embryo utilize slightly different mechanisms to control gene expression has profound implications for how we diagnose and treat fetal diseases."

Provided by Texas A&M University