Researchers unlock how cells determine their functions

February 27 2006

Researchers at the University of California, Riverside have discovered a molecular mechanism directing the fate and function of cells during animal development. The findings could hold promise for the advancement of cancer and stem-cell research.

The research is published in the Feb. 24 edition of the journal *Science*. UCR Biochemistry Professor Frank Sauer, with German colleague Elisabeth Kremmer of the Institut für Molekulare Immunologie in Munich, and fellow UCR researchers Tilman Sanchez-Elsner and Dawei Gou authored the paper titled, Noncoding RNAs of Trithorax Response Elements Recruit Drosophila Ash1 to Ultrabithorax.

The paper explains how proteins, known as epigenetic activators (such as Ash1 from the fruit fly Drosophila), bind to their target DNA and activate genes that determine what function a cell will have in the body.

"The fact that these epigenetic activators, such as Ash1, turn on the expression of specific target genes has been known for some time. However, the mechanisms by which epigenetic activators recognize and bind these target genes was not yet known" Sauer pointed out

"What we were able to show is that the epigenetic activator Ash1is recruited to a target gene through cell-type specific non-coding RNA" he said.

The paper examined how the activator Ash1 binds to target DNA

elements, known as Trithorax-reponse elements (TREs), located in the gene Ultrabithorax (Ubx). Non-coding RNA is produced by and retained at the TREs of Ubx, and helps activate the expression of the Ubx gene by attracting Ash1 to the TREs. The transgenic transcription of non-coding TRE RNA can change the type and function of cells.

"As a result, we can now use non-coding RNAs as tools to actively determine cell fate," Sauer said. "Over the last few years, researchers have focused on how noncoding RNAs silence genes," said Anthony Carter, of the National Institute of General Medical Sciences, which partially funded the research. "Dr. Sauer's work has revealed that noncoding RNAs have a broader range of functions than was previously known, and suggests a model for how they can help activate, rather than silence, a key regulator of animal development."

Source: University of California - Riverside