In stem cells, like real estate, location is most important factor

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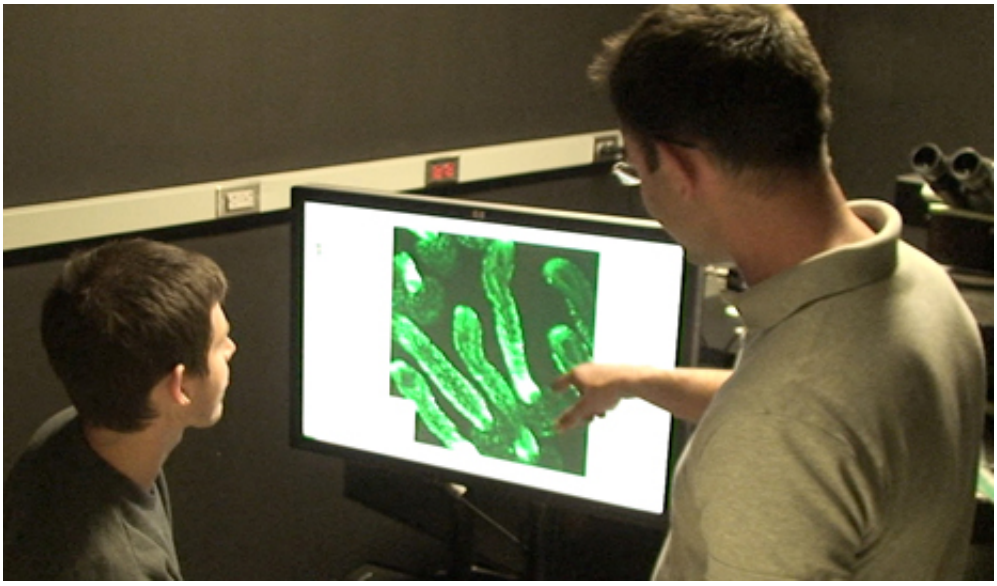

(Medical Xpress)—Stem cells and real estate have this in common: the most important thing is location, location, and location.

Stem cells are extensively studied because of their ability to generate a wide variety of tissue types—from new heart, liver and even brain cells. A new study by Yale School of Medicine researchers published online Oct. 6 in the journal *Nature* shows that the fate of stem cells depends upon their immediate surroundings.

"The emphasis in regeneration has been on studying the intrinsic properties of stem cells, but we have found that where those cells are placed play a much bigger role than the cells themselves," said Valentina Greco, assistant professor of genetics and of dermatology and senior author of the paper. "In a way, it is analogous to human children—what they are exposed to in their environment determines what they become as adults."

Greco's lab developed a novel form of microscopy that allowed them to track over time individual stem cells in the hair follicles of mice. They found that the fate of those stem cells was determined by where along the follicle "niche" they were located. Those at the top showed little activity and only divided periodically to replenish their pool. However, cells in the middle portion of the follicle "niche" proliferated more and produced cells that could create a wide variety of tissue types while those at the base tended to differentiate into specialized cells that build the actual hair shaft.

To their surprise, when they eradicated stem cells in one location, surrounding cells rushed into the "niche" and began regenerating the tissue.

"These data tell us that some adult stem cells may not be as essential as previously thought, since other neighboring cells can change their identity to act as stem cells when the circumstances require it." said Pantelis Rompolas, postdoctoral fellow in Greco's lab and first author of the paper.

"This suggests that if you can duplicate the environment within the niche, then any cells that enter the niche can do the job," Greco said.

The lab is investigating how changes in the tissue environment can regenerate specific cell types.

More information: Spatial organization within a niche as a determinant of stem-cell fate, DOI: 10.1038/nature12602