

Bioluminescence imaging lights up stem cell therapy for hair growth

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Finding a way to restore hair growth after substantial hair loss is something of an obsession worldwide. Investigators at the Society of Nuclear Medicine's 2012 Annual Meeting presented how stem cell research for the development of new hair follicles can be monitored with an optical imaging technique that uses bioluminescence, the same process that allows fireflies to light up.

There is a host of treatments available for hair loss, including creams and drugs, but these have not shown to be very effective for [hair growth](#). Hair [stem cells](#) signal the actual regeneration of hair follicles and natural hair. A [molecular imaging](#) technique called bioluminescence is used to display processes at the [cellular level](#). Bioluminescent signal is generated in specific [chemical substances](#) called substrates. These signals are easily recognized with very sensitive optical imaging systems that can see what is happening in the smallest places—in this case in hair stem cells.

"Hair regeneration using hair stem cells is a promising therapeutic option emerging for hair loss, and molecular imaging can speed up the development of this therapy," says Byeong-Cheol Ahn, M.D., Ph.D., professor and director of the department of nuclear medicine at Kyungpook National University School of Medicine and Hospital in Daegu, South Korea. "This study is the first study of hair follicle regeneration using an in vivo molecular imaging technique."

The current research involves grafting hair stem cells in animal models to investigate if they can grow and proliferate as normal cells do. The

progress of hair stem cell therapy is non-invasively tracked with bioluminescent reporter genes in specialized substrates. There are several bioluminescent reporter genes originating from not only [fireflies](#), but also beetles, glowworms and other bioluminescent organisms. The strategy of using bioluminescent reporter genes is ideal for [stem cell research](#), because bioluminescence works only in living cells.

In this study, researchers used bioluminescence imaging using firefly luciferase coupled with D-luciferin to monitor the engraftment of hair follicle stem cells—called newborn fibroblasts—in mice to track their viability and development into hair follicles over time. Bioluminescence imaging was performed five times over the course of 21 days after transplantation of the stem cells.

Results of the study showed successful bioluminescence imaging for hair regeneration with hair stem cell transplantation, and new hair follicles were apparent on the surface of skin samples under microscope. More studies will have to be conducted before clinical trials could be initiated to verify whether this therapy would work for human hair regeneration.

Provided by Society of Nuclear Medicine

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