

## Hair Follicle Neogenesis in the Adult Pig by Implantation of Trichogenic Cells Obtained from Neonatal Pig Skin

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### ABSTRACT:

Surgical hair restoration as a cosmetic procedure for baldness is limited by the supply of donor site follicles that can be excised and re-implanted to create the illusion of a fuller head of hair. Tissue engineering offers the possibility of hair multiplication by creating follicle-inducing implants from cells harvested from follicles and expanded in culture. We previously reported follicle neogenesis of mouse hair upon subcutaneous injection of dissociated cells obtained from newborn mouse skin into the athymic nude mouse. The goal of the present study was to continue investigation of the follicle neogenesis process in a large animal model affording skin that is anatomically similar to that of the human.

### Materials & Methods:

Purpose bred Sinclair miniature swine were used as subjects under an IACUC approved protocol in compliance with current guidelines. All procedures were conducted using aseptic surgical technique with animals under general anesthesia. Neonatal same-breed skin was obtained and freshly processed by a method similar to that previously described for isolation of dermal and epidermal cells from neonatal mouse skin. Since pig skin, like human skin, is at least 10 times thicker than mouse skin, we sought to implant cells at various levels within the dermis including the fat-dermis interface. This was accomplished by creating precisely dimensioned cavities with an erbium-YAG laser. Cells were combined with Matrigel™ (a surrogate extracellular matrix) and implanted at various depths. As a control, traditional surgical hair transplantation was performed. Routine histological evaluation of biopsy specimens was conducted. In one case, a female adult pig was implanted with male neonatal cells and the resultant implant site evaluated for the presence of hair follicle structures containing male cells *via* FISH analysis using a y-chromosome specific probe.

### Results & Conclusions:

New hair follicles were detected as early as 30 days post-implantation and formed most successfully when the cells were implanted at the level of the fat-dermis interface. In replicate studies, hair follicles formed in 8 out of 18 and in 19 out of 48 implantations. Unlike mouse follicle neogenesis from dissociated cells, which yielded dozens of individual but randomly oriented follicles per injection, the pig cells only formed a single follicle at each implant site. The detection of y-chromosome positive cells in the case where male cells were implanted in the female pig confirmed that the formed follicle contained the implanted cells. These follicles invariably produced ingrown hair shafts. However, this may be endemic to this host system since a surprising rate of ingrown hair was also observed with whole follicle transplantation. We believe this to be the first demonstration of hair follicle neogenesis in the pig by implantation of cells.