The Development of a Pre-clinical Swine Endometriosis Model

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Endometriosis is a benign gynecological condition where endometrial-like tissue grows outside of uterus. However, the exact cause and pathogenesis of endometriosis is unclear. Currently, the gold standard for the diagnosis of endometriosis is laparoscopic surgery which is invasive. Pig is an ideal animal model for human health and diseases because their anatomy and physiology is similar to humans and their genetics is highly conserved to the human. Developing a swine model mimicking pathophysiology of endometriosis and being able to easily distinguish endometriotic lesions from surrounding normal tissues will offer a novel large animal model that assist designing an effective cure. The swine model of endometriosis was generated by using ex vivo labeling of endometrial tissues with Fluorescein isothiocyanate (FITC) dye-doped silica nanoparticles. First, approximately 6 cm of swine uterine tissue was excised from a cycling adult pig under anesthesia. After removing myometrium, the endometrial tissue was then minced (5g of small fragments) and labeled by FITC dye-doped silica nanoparticles. An optimal ex vivo labeling condition in swine endometrial tissue was determined by exposing endometrial tissues to different concentrations of FITC dye-doped silica nanoparticles and incubation times; the optimal labeling condition was identified as incubating the nanoparticles at 60% concentration for 90 minutes. To establish swine endometriosis model, FITC dye-doped silica nanoparticle-labeled endometrial fragments were inoculated into the peritoneum of the same pig as autologous transplantation. To examine the development of endometriotic lesions, we euthanized the pig at 6 weeks post-transplantation and examined endometriosis development. We observed ± 20 FITC-positive ectopic lesions in peritoneal wall as well as outside of the uterus and small intestine using FITC fluorescence detector goggles with a UV flashlight. Histological analysis of the ectopic lesions revealed endometrial-like epithelial and stromal cells from the pig. They were morphologically comparable to human endometriotic lesions. Furthermore, immunohistochemistry detected E-cadherin in the epithelial cells and vimentin in stromal cells of the ectopic lesions. Our results suggest that we were able to induce endometriosis in swine like that in human beings. This will provide a new model to further endometriosis research. Coming up with a swine endometriosis model may help improve not only in the discovery of pathogenesis but also in the development of a non-invasive diagnostic tool.