BIOMEDICAL & VETERINARY SCIENCES GRADUATE PROGRAM

ANNOUNCES

The Master of Science Seminar and Examination of

Kaylyn Williams

"In Vitro Models of Cellular Dedifferentiation for Regenerative Medicine"

Monday, May 7, 2018
12:00 pm
VMIA Classroom 220

Bio

Kaylyn Williams grew up in Roanoke, Virginia. She graduated from the College of William and Mary in 2011 with a Bachelor of Science. Kaylyn will be completing both her Master of Science and Doctor of Veterinary Medicine in May 2018. After graduation, she will join VCA Woodbridge Animal Hospital as an Associate Veterinarian in July 2018.

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VMCVM Office of Research and Graduate Studies

Lay Language Abstract

Stem cells have the ability to self-renew and to differentiate into a variety of cell types. Stem cells can be found naturally in the body, can be derived from the inner cell mass of blastocysts, or can be made by dedifferentiation of adult cells. Regenerative medicine aims to utilize the potential of stem cells to treat disease and injury. The ability to create stem cell lines from a patient's own tissues allows for transplantation without immunosuppressive therapy as well as patient -specific disease modeling and drug testing. The objective of this study was to use cellular dedifferentiation to create in vitro cell lines with which to study regenerative medicine. First, we used siRNA targeted against myogenin to induce the dedifferentiation of murine C2C12 myotubes into myoblasts. Timelapse photography, immunofluorescence, and western blot analysis support successful dedifferentiation into myoblasts. However, the inability to separate the myotubes and myoblasts prior to siRNA treatment confounded the results. This system has the potential to be used to study mechanisms behind muscle cell regeneration and wound healing, but a better method for separating out the myoblasts needs to be developed before this will be achievable. Second, we used a doxycycline-inducible lentiviral vector encoding the transcription factors Oct4, Sox2, cMyc, and Klf4 to create a line of naïve-like porcine induced pluripotent stem cells (iPSCs). This reprogramming vector was verified first in murine cells, the system in which it was developed. Successful production of both murine and porcine iPSC lines was achieved. Both showed alkaline phosphatase activity, immunofluorescence for pluripotency marker (Oct4, Sox2, and Nanog) expression, PCR for upregulation of endogenous pluripotency factors (Oct4, Sox2, cMyc, Klf4, and Nanog), and the ability to form embryoid bodies that expressed markers of all three germ layers. Additionally, we were able to create secondary porcine iPSC lines by exposing cellular outgrowths from embryoid bodies to doxycycline to initiate more efficient production of porcine iPSCs. The secondary porcine iPSCs were similar to the primary porcine iPSCs in their morphology, behavior, alkaline phosphatase expression, and Nanog expression with immunofluorescence. The porcine iPSCs were dependent on doxycycline to maintain pluripotency, indicating that they are not fully reprogrammed. Despite this dependence on doxycyline, this system can be used in the future to study the process

of reprogramming, to develop directed differentiation protocols, and to model diseases.

Presentations

ISSCR Annual Meeting 2014, poster

VMRCVM Research Symposium March 2014, poster

VMRCVM Research Symposium March 2013, poster

Awards and Academic Achievements

Tyler J and Francis F Young Scholarship (Aug 2014 – May 2018)

Outstanding Poster, VMRCVM Research Symposium (March 2013)

Stamps Family Charitable Foundation Scholarship (July 2011 – May 2018)

Examination Graduate Committee

Major Advisor/Chair

Willard Eyestone, PhD
Research Associate Professor
Department of Large Animal Clinical Sciences

Graduate Advising Committee Members:

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Associate Professor
Department of Large Animal Clinical Sciences

William Huckle, MS, PhD
Associate Dean, Graduate School
Associate Professor, Biomedical Sciences and Pathobiology

Colin Bishop, PhD
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