

Stem Cell Research at Dominican

Dominican University of California offers an unusually rich program that allows undergraduate students the chance to engage in state of the art stem cell research, and graduate students to team up with researchers at the Buck Institute for Aging.

It's all part of a push at the university to expand its scientific frontiers.

"We are entering a new era of doing science at Dominican University," said Dr. Sibdas Ghosh, chair of the Department of Natural Sciences and Mathematics, referring to the new science center. The center, which opened last year, replaced five outdated labs in two buildings with a two-story, 35,000 square foot building that houses more than 30 teaching, research and computer technology labs for student and faculty use.

The science program helps prepare students for a variety of careers, from conservation biologists to nurses, from pharmacologists to veterinarians.

Leading the push in stem cell research is Dr. Mohammed El Majdoubi, an assistant professor of biology at Dominican. His research is focused on investigating the differentiation of mouse embryonic stem cells into hormone-secreting neurons *in vitro*, part of the larger mystery of reproductive physiology— how do the brain cells that control reproduction develop in the embryo.

Speaking as an undergraduate professor, Majdoubi offered a pertinent analogy: "Stem cells are the students of the body. They're undeclared. They don't know what they want to be."

But then, like students finding their major, they're committed – and scientists can get to work.

"The stem cells have brought us a model that was not available before," he said. In his lab, Majdoubi and his students are "trying to coax stem cells into becoming hormone-secreting neurons. We can then study their development under a microscope, without using an embryo, or any invasive techniques."

"This is completely investigative," he said. "The students are learning all the techniques that are necessary to grow, manipulate and maintain stem cells."

Majdoubi is proud of the work that's going on in his laboratory. "My students will be able to find a job upon graduation," he said. "Whoever hires them will not have to spend one second training them."

He boasts that three California colleges were selected to present their work at the Capitol Hill in Washington, D.C.: UCLA, USC and Dominican.

Megan Bell, 21, of Benicia, a senior at Dominican, is a biology major with a molecular cell emphasis. She transferred from Solano Community College largely so she could work on stem cell research with Majdoubi.

"We take embryonic stem cells – mouse cells – and by treating them with certain chemicals, we're able to direct these pluripotent cells into becoming different adult cell types," such as neuroendocrine cells, neurons and muscle cells, she said.

She emphasized that they're not working with mice, but with cell lines. "I don't know the last time it saw the inside of a mouse," she said.

Majdoubi does. "This cell line has been growing since the mouse mom died in 1988," he said. "You can grow them and collect them and have an infinite amount of cells."

They're using the stem cells to make hormone-secreting neurons. "Those actually secrete many hormones that are important in homeostasis" Bell said. "They play a significant role in regulating the body. Potentially, these neurons can be used as treatment for reproductive, metabolic and neuroendocrine diseases."

It may be that certain neuroendocrine cells that lack the necessary hormones could be replaced with healthier cells. That sort of potential has researchers excited.

"We look at how to keep the cells growing, and how to push them to differentiate" she said. "If we understand how these embryonic stem cells work, we can apply that knowledge to how adult cells develop in general. And we can study all of that *in vitro*," or in a test tube.

That sort of enthusiasm has Majdoubi excited. He loves working with younger students. "I choose to work with undergraduates," he said. "I wish I could also go earlier, to high school. If you want to inspire people, you have to reach them early in life. Graduate students are already specialized. I want to inspire someone early on."

Majdoubi – who has plenty of youthful enthusiasm in his own demeanor and speech – worked for four years as director of the Cell Imaging Core in the Center for Reproductive Sciences at UC San Francisco. Majdoubi has published 17 scientific papers and has given 18 presentations at international meetings. He also is a reviewer for the journal *Neuroendocrinology*.

In his presentation at the February conference, Majdoubi showed a slide of cells that looked almost like green hills on a topographical map. "Imagine being a student in the lab," he said. "It's 10 p.m., and no one is around."

He clicked a button and the slide started throbbing. The audience gasped. "These are beating heart cells in a dish," he said. "They can stick to the heart and start beating on their own."

"This shows the promise of stem cells and the pitfalls of stem cells," he said. "If the cells that fail to differentiate are also transferred, we don't know how they would behave. It could be the origin of a tumor."

Majdoubi works with graduate students as well, in collaboration with researchers at the Buck Institute for Age Research in Novato. "That's a high level of intensive research," he said. "My students learn their techniques at an undergraduate level, and then can expand their knowledge at the Buck Institute."

"We're having them go through two different systems, but it's a normal evolution," he said. "You walk before you run."

At the Buck Institute, the students are working five days a week as full-time researchers. "It's a research-based master's degree," he said. "This is the closest you can get to a doctoral school in Marin County."

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