Western Faculty Profile: Dr. Lina Dagnino

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No conflicts of interest declared.

Background

Dr. Lina Dagnino is a professor in the Department of Physiology and Pharmacology. Her research focuses on skin biology, specifically looking at stem cells and mechanisms of cellular differentiation in wound healing and cancer. She is an instructor for Pharmacology 3620 and 4540. Dr. Dagnino was born and raised in Mexico and completed a bachelor's degree in Chemistry at the Universidad Autonoma del Estado de Mexico. She obtained her masters degree in synthetic organic chemistry and her PhD in pharmacology from the University of Alberta.

What factors led you to pursue a career in research?

The undergraduate chemistry program that I took was very, very heavy in terms of lab work. In Canada, for example you have a major in something or a minor in something else but you also have

other courses that have nothing to do with your subject. And that's great because it gives you a rounded education. In Mexico, the programs are very specialized, so when I decided to go into chemistry, all the things I did for four years were chemistry related. Organic chemistry, inorganic chemistry, physics, math, analytical chemistry, you name it. And every course there had a lab associated with it. We would take a similar number of courses as Western students – 5 or so courses per term, and each had a lab associated with it. We would spend about 5 hours per day on lectures, and another 4-5 hours in labs. That was the first time when I realized what lab work was, and I liked doing experiments and working in the lab. In order to graduate in Mexico, you have to produce a thesis. A couple professors at my university had research labs at the national university in Mexico City. I ended up completing my thesis with one of the professors for about a year. I continued liking research,

and so through all those years doing labs and original experiments, I concluded that I was interested in doing research. Doing research is like exploring—nobody's been where you're going. You are discovering things, and I've always been interested in doing that.

You grew up in Mexico, but came to Canada. Why?

It's kind of a convoluted story—when I was doing my undergrad, I wanted to do graduate work, and I knew I wanted to do research and go abroad. I planned to apply for Mexico's scholarship programs for students to study abroad, but the plan had to change because there was a big economic crisis in Mexico. The federal government organization in Mexico continued to support students already abroad, but stopped giving new scholarships for a couple years, which coincided with the time I was trying to apply. I still applied to a number of different places but I was limited by universities that would offer TA positions that could support my studies. The University of Alberta had a low differential for international students and I got TA positions that were sufficient to cover all my expenses. The first acceptance letter that I got was from the University of Alberta and it included a TA position. Everything fell into place for the University of Alberta, including the student visa, and the university had a very good program for what I wanted to do. It worked out really well in the end, because at that time they had the Alberta Heritage Fund for American Research Scholarships—and they did not distinguish between international and domestic students. I was able to apply for scholarships from them to finish my masters degree, and then when I graduated and went to pursue a PhD from the same school, I was able to apply for a doctoral scholarship from the same organization.

Do you think a future “cure” for skin cancer is more likely to be preventative from better sunscreen development, or is it more likely to be better treatment for aggressive skin cancers?

It probably will have to be a combination of both. We have very effective sunscreens already, but most of them don't block UV light—they only reduce the damage that UV light produces. Titanium oxide is the exception—it truly blocks the sunlight from penetrating the skin. Most of the chemical based sunscreens reduce the effects of UV; if you take SPF 30—it means that it protects you by reducing 30 times of the equivalent amount of time under the sun. If you stay 30 minutes in the sun but you put on sunscreen with SPF 30, it would be like staying one minute in the sun. You're still getting exposure to UV light anyway.

The advantage of skin cancers is that you can see them, detect them early, and can easily remove them. Squamous cell carcinomas and basal cell carcinomas are generally found before they can metastasize; some of them don't even metastasize very well or at all. Melanomas are different because they are very aggressive from the beginning and have no effective treatment. In many cases, somebody can discover a melanoma that still looks very small, but some of those cells may have already metastasized. Most people who die from melanoma die from metastases, not from the primary tumor. Currently, treatments aren't very good and melanoma cells acquire resistance very quickly. However, there are a lot of people working on solutions.

The other important thing is to educate and convince people of the dangers of UV light. The prevalence of melanoma and other skin cancers is rising quite a bit, particularly among the younger population. It is associated with things such as tanning beds or spending a full day at the beach. We all know that UV light is bad for you, and that you should put sunscreen on, and that you should

avoid being in the sun from 1 to 3pm. This information is out—everyone has heard it. Yet, people's behaviour doesn't seem to be changing according to that.

We know with all certainty that a huge portion of skin cancers arise from UV damage. We continue discovering different ways in which the transformation of skin cells occurs. Redheads have a greater incidence of some skin cancers than you would expect in comparison to the normal population. A recent study by Irish researchers discovered that there are different types of melanin – darker melanin, and a different type of melanin produced by people with red hair. People with a fair complexion tend to produce less dark melanin. But redheads produce this different type of melanin; what happens is that when this melanin is exposed to UV light, it forms free radicals. This reaction continues longer than for the dark melanin. Melanin, which is supposed to protect cells from UV damage, actually becomes a vehicle for cell damage. Radicals continue to be produced for a period after UV exposure ends. These findings came as a surprise—nobody expected that something like that would happen. I imagine that as people continue research, more particular susceptibilities for specific populations will be discovered. People such as redheads can minimize damage by staying out of the sun and by using sunscreen, but the fact is they are more likely to develop skin cancer than the general population.

What is the most difficult part of your job at Western?

The challenging and the most satisfying part of my work is that it's like running two or three different occupations at once. Running a lab is fun from the point of view of science, in that it's challenging and interesting. It requires a lot of perseverance because your experiments don't always work. At the same time, running a lab is a little bit like running a small business: you have a budget and personnel that you have to look after. My students spend so much time in the lab with

me, what they do there is going to affect where they go in the future as well. In a way, I have a big responsibility in terms of making sure I mentor them well. We have to generate funding from funding agencies so that we can maintain our research. It's fine—but again, nobody gives you the money, you have to chase it. It's stimulating, but it's a challenge and it can be frustrating sometimes. I also have a teaching mandate which gives me the opportunity to communicate some of what I learn in my research or research that I am interested in. It's something that I have to be very careful with because I can potentially influence a lot of people when I teach. Teaching and research are happening at the same time, such that I cannot drop one and concentrate on the other. However, it's also nice because if things are not working very well on one end, chances are they will be working well on the other end.

Do you have any advice for students interested in a career in research?

For research and for any other route people choose, you have to find something that you like and feel passionate about. Things are not always going to work well and you have to be motivated so that doesn't affect you too much. For students now, there are so many opportunities, but at the same time, it's difficult to choose because there are so many options. Sometimes you may have a good idea of what some things are, but not others. So how do you choose among all these different things that you don't quite know? I would say, if somebody is interested in research or exploring what research is, by all means, try it. I realize it's not for everybody, but whatever you do, start out by being interested or being curious about it. Because then you're going to start out on a positive note with a positive attitude. If you think that it's something that you do because you couldn't possibly find something else that you like, then that's not a good reason to do it. Imagine doing something that you really don't want to do, eight hours

a day, or longer, for a long time. It applies to research, but it applies to anything else.

And it's okay not to know and try it. I would say for anything that anybody tries (not just research, but in general), you have to give it a good, honest try. If you do it and you like it, that's fabulous, if you do it and still are not sure, at least you gave it your best shot. Research is like playing tennis or golf, it is a jealous activity in the sense that if you don't go put enough time and effort, it's not going to work out.