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Biophysicist in Profile

Julie Dalziel's long-running interest in science was sparked into a career by an excellent Intermediate School science teacher. Dalziel went to Victoria University of Wellington, New Zealand, where she earned her Bachelor of Science degree in physiology with honors. A subsequent summer student scholarship at the John Curtin School of Medical Research (JCSMR), Australian National University at Canberra, gave Dalziel her first taste of research, which proved addictive. "After a summer of patch-clamping, I was completely hooked on a research career," she said.

Following that spark, Dalziel headed back to JCSMR to work on her PhD in molecular neuroscience. Her PhD research, supervised by *Bryndis Birnir* and the late *Peter Gage*, focused on how structural components of GABA A receptors relate to their functional properties of activation by GABA, and investigation of drugs that modulate their activity, including barbiturates. During her PhD project, Dalziel was introduced to the Biophysical Society. "I received a travel grant to the Annual Meeting in 1988," explained Dalziel. Her first trip was extremely successful, as she also left as a winner of the Student Research Achievement Award poster competition, and the meeting

After a summer of patchclamping, I was completely hooked on a research career helped her decide to spend her postdoc time with *Rick Aldrich* at Stanford University. During her postdoc, Dalziel added voltage-gated K⁺ ion channels to her work.

"Julie was a new postdoc in the Aldrich lab when I joined the lab," explained *Andrea Meredith*, who has since collaborated extensively with Dalziel. After her postdoc, Dalziel had the opportunity to return to New

Zealand to join AgResearch, a unique company that is funded partially by the government and partially by industry, which allowed her to work on the links between basic science and applications in food and agriculture. While at AgResearch, Dalziel led a project team that investigated the effects of an active compound, lolitrem B, from a fungus that grows in agricultural grasses in New Zealand, and causes a debilitating neurological condition known as 'ryegrass staggers' in farm animals that ingest the toxin. Dalziel and her colleagues characterized the effects of the compound on BK currents expressed in HEK cells, and used patch-clamp experiments to discover that the endophyte-produced toxin lolitrem B potently inhibited BK channels, implicating them in the condition. Back at Stanford, Meredith had made a genetic deletion of the BK channel in a mouse. Since Meredith's work was relevant to Dalziel's research, she sent a student, Wendy Imlach, to work with Meredith at Stanford. Imlach took the data back to New Zealand to be incorporated into Dalziel's work. "The study was fun," laughed Meredith, "and given the involvement of farm animals and fungi-infected grass, it was also totally off the beaten path of what I usually think about in science!" The resulting paper provided important new insights into the successful mitiga-

– Julie Dalziel

AUGUST

tion of this long-standing agricultural challenge in New Zealand, but it took a while to publish—few journals were interested in the struggles of Kiwi farm animals!

Today, Dalziel is a senior scientist in the Food Nutrition & Health Team at AgResearch, focused on understanding the effects of agricultural food products on intestinal health, particularly intestinal motility. In several collaborations, Dalziel studies colonic muscle contractions in vitro (with Nick Spencer, Flinders University, Adelaide, Australia) and the ion channel activity of insect odor receptors from Drosophila (with sister research institute, Plant & Food Research). "Julie is a key researcher in one of my projects focusing on dairy-based food solutions for improved intestinal barrier function," said Nicole Roy, leader of the Food Nutrition & Health Team at AgResearch. "She is a supportive colleague who has demonstrated exceptional resilience in adapting to a new team and developing a new research focus. Julie meticulously prepared her research plan, her approaches are sound, and her delivery is excellent."

Recently, Dalziel's research has turned to investigating the mode of action for a toxin complex from a bacterium that is lethal to the New Zealand grass grub, a major agricultural pest in New Zealand. "We've discovered that the toxin creates pores in planar bilayer lipid membranes, which is likely to be important for its toxicity, and may contribute to a bio-control solution for agriculture," explained Dalziel.

Though the type of research she does can be a challenge, Dalziel feels privileged to do research for her career. "Working in an agricultural research institute, the diversity of research we do means I've had to ensure a good general knowledge of science and agriculture," said Dalziel. "Keeping up with the literature for a range of subject areas can be demanding, but it keeps it interesting." Adding to the challenging nature of the research is the task Dalziel faces securing the investment needed to do the research. AgResearch is a government-owned company that is funded in part by the government and in part by industry. The work tends to be industry-focused, with the fundamental goal of creating value and impact for the agricultural sector, yet researchers still need to publish work to maintain scientific credibility. "We often work in large interdisciplinary, multi-organization projects where good communication is essential," said Dalziel. "This is to ensure the appropriate question is being addressed, and that the findings are communicated to industry in a useful manner."

Even with the unusual challenges she faces, Dalziel is motivated by the potential to improve global food and agriculture using electrophysiology and other physiology techniques. "The advent of new technologies for investigating ion channel function that will make ion channel biosensors a reality is a very exciting area of development," she said. "I hope to contribute to the future of this area of science through the mentoring of graduate students and interns at AgResearch, by teaching them techniques in electrophysiology." It may not come as a surprise to her students that she suggests looking into a wide range of career options. "Embrace multidisciplinary approaches and build up a suite of techniques to address a range of questions," she suggested. "Then find what career appeals to you and cut your own path."

When she's not in the lab, Dalziel enjoys gardening and playing the piano in a music group. She and her husband, *Brent Barrett*, who is originally from Washington state and also a scientist at AgResearch, enjoy tramping—a New Zealander's term for hiking through mud—and cycling. "Julie is the quintessential Kiwi," explained Meredith. "When I first met her in California, she rode her bike to work—even in the rain!"



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Julie and her husband Brent at the Tongariro National Park in New Zealand.



Julie hiking on Hollyford Track in Fiordland National Park.