In the stark orthopaedics lab at the University of Vermont College of Medicine in Burlington, participant after participant endures the insertion of hair-thin needles mid-thigh and just below the knee, while five researchers, led by Research Associate Professor of Neurology and Orthopaedics Helene Langevin, M.D., monitor a body of machinery: ultrasound scanner, torque sensor, electrocardiograph, and laptop, on which the volunteers rate the needling sensations on a scale of 0 to 10.

Langevin, glasses halfway down her nose, hovers between the device that is measuring torque and the study volunteer — in this instance, Sue Burns, an administrator in the university’s biochemistry department who suffers from arthritis and is facing hip-replacement surgery. Burns became a study subject because she’s interested in acupuncture and the possibility that it might relieve her pain.
We’re trying to relate what’s going on locally with your perceptions and your cardiovascular function,” Langevin tells her. This on-going study, which is largely aimed at investigating the torque, or twisting force used in needle rotation, is the latest in Langevin’s dogged, single-minded quest to pinpoint the scientific basis behind the Chinese healing art that has been practiced for millennia but whose physics has never been fully understood.

Demystifying acupuncture could eventually mean better diagnosis and treatment of ailments like chronic pain and usher acupuncture into this country’s medical mainstream. Only an estimated 4 percent of U.S. adults have tried acupuncture. “Unless we understand the mechanism of these treatments,” Langevin says, “it’s going to be very hard for them to get integrated into our health care system, including insurance reimbursements.”

Langevin’s innovative research into the ancient therapy has gained nationwide, even worldwide, attention. Langevin — a third-generation physician who is both a board-certified internist (with a specialty in endocrinology) and licensed acupuncturist — presented her findings at scientific meetings in China and Hong Kong this past December. Two months earlier, she won a grant worth an expected $1.9 million from the National Institutes of Health’s Biomedical Research Grant, or NIH’s biomechanical component, or needle grasp, by measuring the force necessary to pull an acupuncture needle out of the skin.

Her research showed something else: Gently manipulating the needles back and forth or twisting them clockwise significantly increased the pullout force — which sometimes reached 500 grams, or slightly more than a pound — over no rotation at all. The increase was 52 percent with back-and-forth movement, and 167 percent with clockwise turning. Moreover, the force needed to retract a needle, with or without rotation, was on average 18 percent greater at traditional acupuncture sites than at control points.

“The important thing is that needle manipulation increases needle grasp, and we found this everywhere — but slightly more at acupuncture points,” Langevin says.

A key to Langevin’s receiving her first grant was a custom-made, hand-held needling device resembling a dentist’s drill that records all the measurable parameters on an attached computer; an earlier proposal in which acupuncture needles were inserted and retracted by hand was rejected because investigator bias could not be eliminated.

Four years ago, Langevin and partners David L. Churchill, Ph.D., an engineer at MicroStrain Inc. in Williston, and Burlington acupuncturists Robert Davis and Bonnie Povolny, founded Stromatec Inc., a Burlington company now developing prototype needles — a miniaturized version of the needling device — for possible use in teaching acupuncture researchers in the country. The venture was underwritten by a National Institutes of Health grant that encourages investigators who are also inventors to take their inventions beyond what you could even imagine.”

That’s it. That’s the kilogram of indefatigable ego, coupled with the high quality of Langevin’s research, that has earned her the respect of fellow physicians, acupuncturists, and researchers. “She’s trained as an acupuncturist, but she’s not a proponent,” Kaptchuk says. “One of the things that’s really remarkable about her work is it’s the only acupuncture research that absolutely provides synergy. She measures every thrust, every force.”

U sing needle and ultrasound imaging, Langevin and her team are now beginning to test her newest hypothesis: that connective tissue abnormalities occur more frequently in patients with low back pain than others.

“So far, we don’t know that there’s anything wrong with the connective tissue in people with low back pain,” she says. “But if we determine the winding is abnormal, this would be a hint that the connective tissue may cause or perpetuate this pain.”

Such a discovery could eventually lead to better treatment options for sufferers, including not only acupuncture but also manual-based therapies like massage.

Langevin’s attempt to elucidate the mechanism of acupuncture by looking at cellular changes in the poorly studied connective tissue is novel. “There are Western scientists who think it’s all about nerve stimulation,” says Peter Wayne, Ph.D., former research director of the New England School of Acupuncture in Watertown, Mass., and the new director of Tai Chi research programs at Harvard reviewed Journal of Applied Physiology published the results of a landmark study in which she and her colleagues quantified de qi’s biomechanical component, or needle grasp, by measuring the force necessary to pull an acupuncture needle out of the skin.

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“Every now and then someone is in the right place at the right time and makes a sentient observation that revolutionizes a field,” he says. “She’s a crisp thinker. She’s made it a scientific discipline when so much of it was smoke and mirrors.”

Hamill recalls that when Langevin first came to the university ten years ago, she was merely looking for “a corner of a lab bench.” Today, she runs her own lab, staffed with an assistant, research engineer, and two technicians. “From this very meager beginning, she very quickly captivated a lot of folks. She has a remarkable ability to look across disciplines and bring technology and approaches from other fields to the questions she is asking,” he says, noting Langevin’s collaboration with the departments of physics, radiology, pathology, and medical biostatistics, among others.

An unlikely West-meets-East trailblazer, Langevin has presented her research at scientific gatherings in Barcelona and Munich, among a number of foreign cities, in the past two years. But recent lectures to researchers at the Shanghai University of Traditional Chinese Medicine and the Chinese University of Hong Kong — in the birthplace of acupuncture — were particularly unusual for a foreigner. “I did not know what kind of reception I was going to get,” Langevin admits, “but they were very cued into what I was talking about. They were enthusiastic about the research.”

Back home in Vermont, the French-Canadian professor walks or bikes to campus from the nearby home she shares with her husband and two children. I do go home to my kids each night. And I do relax,” says Langevin. But in the lab, she is known for her formidable focus on the task at hand. “She’s like a laser beam,” says Jim Fox, the research engineer in her lab.

Hers is an intellectual curiosity born of personal experience. During her residency at Johns Hopkins Hospital in 1985, Langevin sought acupuncture for nerve-injury pain after exhausting all that Western medicine had to offer. After three months of treatments on her leg, her pain was gone. “I was intrigued by this strange way of looking at the anatomy in terms of the meridians,” she says. “The fact that I got better was almost irrelevant in my decision to study it.”

But Langevin’s relentless fascination with acupuncture has only raised more questions — and more hypotheses — and she tosses them rapid-fire into the air as if to make room for new ones already forming in her mind. “What are meridians? What are the needles doing? What kind of effect does it have on the tissue? How does it help the body heal?” she wonders. “If we understood all that, I think doctors would feel much more comfortable recommending acupuncture.”

Until then, Langevin will continue the hunt for answers. “I love this work,” she says. “I truly love it.” And it isn’t hard to image her 20 years from now, holeed up in her office, the itch to understand the science behind acupuncture still under her skin.

“Helene has single-handedly rescued acupuncture research from the dead end it had reached because of [previous] findings that had been inconclusive or contradictory,” Kapitchuk says. “I don’t know if Helene is going to solve the acupuncture riddle, but she has the best chance of anybody.”

The growing role of complementary medicine was recognized nine years ago with the formation of the National Center for Complementary and Alternative Medicine (NCCAM), the nation’s lead agency for the study of traditional healing in the context of rigorous science.

Researchers at the College of Medicine are studying the healing properties of the leaves of the Ginkgo biloba tree, one of the oldest tree species in the world, which have been used for thousands of years in traditional Chinese medicine to treat diseases of the heart and lungs, and to “benefit the brain.”

Today, scientists at UVM’s Laboratory for Clinical Biochemistry Research, led by Senior Associate Dean for Research and Academic Affairs Russell Tracy, Ph.D., participate in the Ginkgo Evaluation of Memory Study (GEM), an NCCAM-funded study that seeks to find out if medicine made from the ginkgo leaf can delay dementia, the common changes in memory, thinking and personality that can occur with age. GEM may help to determine if Ginkgo biloba can help to slow or prevent the progression of Alzheimer’s disease.

In other ginkgo-related research, Professor of Anatomy & Neurobiology and Neurology Felix Eckenstein, Ph.D., and colleagues have published on the prevention of age-related spatial memory deficits in transgenic mouse model of Alzheimer’s disease by Ginkgo biloba treatment.

On the educational front, the Consortium of Academic Health Centers for Integrative Medicine recently accepted the UVM College of Medicine as one of four new member schools: Yale, Stanford, the University of Colorado were the others admitted. This prestigious opportunity allows the College to join with 35 other academic centers to further understand and knowledge in integrative health.