# The power of ginseng: From lore to lab

December 31, 2010

Nicole Baute

There was always a free dinner at the Silver Moon restaurant for foragers who delivered the precious root.

Mary Wong, 53, remembers ginseng roots drying in baskets on the kitchen floor of the Chinese restaurant her parents ran in Peterborough in the ’70s.

“They would just trade it in for a dinner for two,” says Wong of the forestry workers and First Nations people who peddled the native plant. “The stuff would probably cost hundreds of dollars in Hong Kong.”

Wong’s parents, who moved to Canada when she was 8, knew it was worth much, much more. That’s why they stashed it away to bring back to the East, where ginseng has been used in traditional Chinese medicine for thousands of years. Wong still keeps a few jars of those old roots in her North York home.

Despite growing up around the herb, she didn’t start taking ginseng until her 30s. Wong was 5-foot-2, 180 pounds and had Type 2 diabetes when she was attacked by a dog on her Canada Post route, sending her into a six-month spiral of anxiety and insomnia.

“My mom gave me ginseng to take because I was really nervous; I couldn’t sleep,” Wong says. “That’s when I realized how powerful it is.”

Wong now takes 12 ginseng capsules a day, weighs 140 pounds and has energy to burn. She still has a mail route but also runs a business called Mary Ginseng House, selling more than 30 health and beauty products made with Ontario’s world-famous farmed ginseng.

She says it gives her energy, keeps her skin youthful and tames her blood sugar levels. And there’s one other thing it does for couples, although she says she would never advertise it: “Some men, because they’re so overworked and they’re tired, they really don’t want to have sex with their wife, because they can’t,” Wong says. “Once your immune system is good, the whole body is working well.”

Jeffrey Yeung, a ginseng buyer from Hong Kong, looks over some of this year's crop as it is cleaned and prepared for drying on Mario Slegers' farm near Strathroy, Ontario, Oct. 29, 2010.

Dave Chidley/FOR THE TORONTO STAR

**Shops in Toronto’s** Chinatown are filled with all shapes and sizes of dried ginseng root, some selling for as much as $336 a pound. Many Chinese-Canadian families put slices of the dried herb in chicken noodle soup for strength, immunity and energy.

Ginseng has been prescribed by Eastern doctors for thousands of years. Traditionally, Westerners have been skeptical, preferring to rely on physicians and pills to cure what ails them. That has been changing in recent years, in part due to aging baby boomers chasing the fountain of youth, but also because of growing immigrant populations seeking treatments from home.

Consumer demand for naturopathic and alternative medicines is growing, and the race to back ancient health claims with scientific evidence is heating up.

Canada even has a commercial ginseng success story in Cold-FX, sold as an immunity booster.

While this province exports 2,700 tonnes of farmed ginseng to health-conscious consumers around the world every year, Ontario scientists are working in their labs to prove the herb is as valuable as the Chinese have believed for thousands of years.

In 1995, John Arnason applied for a Natural Science and Engineering Research Council grant, proposing to study the active ingredients in ginseng and echinacea products on the market and evaluate their purity.

The grant was turned down, for reasons that could not have been clearer. In his rejection letter one reviewer wrote, “Why should we fund Arnason to do research on an unethical product being foisted on a gullible public?”

“Very harsh, but that was the old-style pharmaceutical attitude,” the University of Ottawa biology professor says.

Arnason had noticed disconcerting trends in the market, where skyrocketing interest in herbal remedies created a free-for-all in which consumers had no guarantee the products they were buying were safe — or if they even contained what was advertised on the label. In 1999, Health Canada created the Natural Health Products Directorate to try to address the problem.

After years of consultations, the regulations that came into effect in 2004 listed 83 natural products, including vitamins and minerals, herbal remedies, homeopathic medicines, traditional Chinese medicine and probiotics, that were pre-approved by Health Canada under a “monograph” system dictating what health claims the products can be sold for.

For example, the monograph for ginseng says it can be marketed for immunity, nervousness and “the promotion of healthy glucose levels,” as well as uses in traditional Chinese medicine including dry throat and mouth, cough and asthma.

There are now 191 products with monographs, and Health Canada has also approved 7,200 non-traditional products whose manufacturers conducted clinical studies that proved their efficacy, or provided other forms of proof to back their claims.

The new regulatory process, which allowed companies to market the health benefits of their products, created new energy among researchers and entrepreneurs, including Jacqueline Shan, co-founder and chief scientific officer of Afexa Life Sciences, the company that made a fortune selling Cold-FX to everyone from Don Cherry to Margaret Atwood.

Cold-FX, made with a patented extract of ginseng, was approved in 2007 with the claim that it boosts immunity to stave off cold and flu. To back its application to Health Canada, the company provided results from clinical trials on humans.

But when the Edmonton-based company was starting out in 1992, Shan says, most Western scientists considered herbal medicine “witchcraft,” saying it lacked credibility.

**While scientists try** to dismantle Western concerns about the efficacy of herbs, traditional Chinese medicine remains vibrant in China, where ginseng has long been revered as the miracle “man-root.”

Asian ginseng was first discovered more than 5,000 years ago in the mountains of Manchuria. In the early 1700s, another species now called North American ginseng was found growing near Montreal by a Jesuit priest.

European settlers shipped so much wild North American ginseng to Asia that by the end of the 19th century it was almost extinct in Ontario.

Today, the bulk of the world’s North American ginseng comes from Ontario’s fertile soil, grown by independent farmers in former tobacco fields, under thick black shades that mimic a forest’s canopy.

Piles of wet ginseng lumber down a conveyer belt in Mario Slegers’ barn near Strathroy, about 35 kilometres west of London. Workers in rubber gloves sort through the tangled mess of pale yellow roots, tossing rejects into orange bins to be sold as seconds. The rest are dumped into trays to be dried.

Every fall, buyers come to Ontario to inspect the harvest and negotiate sales. About 90 per cent of the Ontario crop is sold internationally, mostly to Hong Kong. From there it’s sent into mainland China, where it is sorted, graded and processed before making its way to retailers across the country — and eventually around the world.

On a Friday afternoon in late October, a young businessman from Hong Kong turns up unexpectedly at Slegers’ farm, looking to make a deal.

Hands folded politely behind his back, Jeffrey Yeung looks down at a large tray of fresh ginseng ready for the dryer.

“Here the ginseng is good quality,” Yeung says. “In China, everyone wants America, Canada. They don’t want to eat Chinese ginseng.”

Slegers can spend hours bargaining with potential buyers outside his barn, “kicking the dirt,” as he puts it. The lanky, 50-year-old father of four grows 16 hectares of ginseng, and hopes to get $20 a pound this year. He needs $16 to cover his costs, but some years the price has been as low as $8. And some days, like today, buyers leave without reaching a deal.

It wasn’t until the late ’70s and early ’80s, when the Southwestern Ontario tobacco industry began to wane, that many farmers started growing ginseng. It’s a finicky perennial plant whose root takes three or four years to grow to harvest size. There is no ginseng seed bank — every ginseng farmer collects and germinates his own seed, a labour-intensive process.

In the late ’90s so many farmers had switched to ginseng from tobacco that prices fell and many went out of business. Where there were once 300 growers, today there are 140.

Ginseng, worth an estimated $100 million in annual exports, is one of the top field-grown horticultural crops in Ontario, behind potatoes, tomatoes and apples.

**Ed Lui is** a regular visitor to Slegers’ ginseng farm, where Slegers calls him “doc.” The professor was born in Hong Kong, where his family manufactured a traditional Chinese tonic made of 20 herbs. Watching his father prepare the formula filled young Lui with questions: Why were there so many components? Why did they have to steam some of the herbs? “It sort of nurtured my curiosity,” he says. “I always wanted to develop one-of-a-kind things, to be different.”

Although some of his siblings went to medical school, Lui was more interested in drug design. In 1967, he moved to Canada for an undergraduate pharmacy program at Dalhousie University, staying on for a master’s degree and then a Ph.D. He later landed a job as a professor at the University of Western Ontario, where he has worked for the past 30 years.

The 63-year-old heads a $20.8 million research project into Ontario ginseng, which includes a $6.9 million grant from the provincial government. One of the goals of the five-year project, known as the Ontario Ginseng Innovation Research Consortium, is to boost the province’s ginseng industry.

“This project is focused on a pretty important growing market for ginseng all around the world,” says George Ross, Ontario’s deputy minister of research and innovation. Before writing the grant application, Lui had to persuade top scientists to conduct experiments with ginseng: experts in pharmacology, physiology, biology and neurobiology. Most were reluctant to accept that a herb could help treat the diseases they had long studied.

“One of my accomplishments is that normally, or in the past, people involved in herbal medicine were considered by our peers as second-class citizens,” Lui says.

Now they can be found at some of the continent’s best universities. At Yale, Yung-chi “Tommy” Cheng is studying an ancient Chinese formula called Huang Qin Tang, which he has found reduces side effects caused by chemotherapy. The pharmacology professor is a world leader in the movement to validate traditional Chinese medicine with Western science.

Today about 20 scientists and 30 trainees from Ontario universities are involved in the ginseng consortium. They are taking many of the health claims attributed to ginseng and testing them in the lab, mostly on mice and rats. It is really an aphrodisiac? Can it protect you from heart failure? Strengthen your immune system? Fight diabetes?

“It seems too good to be true, right?” Lui says. “It’s good for so many different things.”

**Lique Coolen,** a Dutch neurobiologist who has studied sexual behaviour for 17 years, is one of the skeptical scientists that Lui convinced. At the University of Western Ontario, she and grad student Matthew Barnes have been feeding ginseng to obese rats with health problems similar to pre-diabetic humans, including reduced sexual ability.

Ph.D. student Karla Frohmader lifts a black-and-white rat out of a cage. “Come on lady, let’s go,” she says, dropping the female into a cage where a male is waiting. Seven other pairs are already mating in separate cages, mounting and dismounting and occasionally squeaking.

Frohmader and Barnes are recording how many times the male rats penetrate the females and how long ejaculation takes.

As soon as Frohmader settles back into her chair and picks up her clipboard, a male rat has mounted his assigned mate. “Some of these guys are pretty good for (virgins),” she says to Barnes. Unfortunately, Barnes says, that particular rat is a control subject, meaning he has not been receiving ginseng. His prowess is a tiny strike against the hypothesis that ginseng improves sexual function.

A rustling sound comes from another cage. A male rat is wrapped around his partner’s waist, his face tilted toward the ceiling.

“Number four, E,” Frohmader says. That’s code for ejaculation. That rat has been fed ginseng for the past 28 days. One point for ginseng.

Coolen’s team is trying to figure out where in the body the ginseng is working. Previous research has shown ginseng stimulates erectile tissues in the penis, but Coolen believes it may also affect the central nervous system.

“The next step for us is moving away from the male studies and starting to focus on female studies,” says Coolen. “I’m very excited about that.”

The root's active ingredients are polysaccharides, chains of large sugar molecules that stimulate the body's immune system, and 30 or 40 ginsenosides, small, water-soluble molecules responsible for most of the other effects. Asian and North American ginseng have different ratios of the same ginsenosides, making their medicinal effects slightly different.

The quality and chemical makeup of ginseng varies from plant to plant. That is perhaps the biggest roadblock for botanical drugs: product inconsistency makes it difficult if not impossible to guarantee that one product will be as safe and effective as the next.

In the 2 ½ years since the project began, Lui has become a self-described "jack of all trades." Besides testing ginseng's medicinal effects, he is also working with other scientists on plant genetics, seeding and cloning plants, and analyzing the chemical makeup of the ginseng root.

His dream is to develop different varieties, each with distinct medicinal effects, as Korean scientists have already done with Asian ginseng.

Lui and his colleagues aren't the only Ontario researchers working with the herb. Vladimir Vuksan, a University of Toronto professor and diabetes researcher at St. Michael's Hospital, has been studying ginseng for more than 12 years. He says his team is way ahead of Lui in clinical research on Type 2 diabetes, work Mary Wong supported with some ginseng samples and her expertise in grading and testing.

**The growing field** is competitive for a reason: although it is still difficult to get funding for herbal medicine research, the payoffs could be huge. Cold-FX, for example, made $97 million in revenue in 2008 and 2009. Last year, it was a sponsor at the Vancouver Olympics.

Shan believes the botanical drug industry could be worth billions in 10 to 15 years, especially if big pharmaceutical companies get involved. She says there are roughly 250,000 medicinal plants around the world, but only a quarter have ever been studied.

In the process of taking their ginseng extract from lab to market, the makers of Cold-FX have run into their share of troubles. The company has been accused of mining its research for evidence to suit its claims. And Cold-FX flopped on the U.S. market, where regulations meant it had to be sold as a dietary supplement.

But now Shan is eyeing the FDA's botanical drug designation, which has only one approved prescription product — an ointment for genital warts made with green tea extract. "We're very excited," she says. "Although there are risks, there are uncertainties, we think the opportunity is much bigger. We think we are (closer) probably than anybody else to get into this category."

Where companies take chances, university researchers are more tentative. But Lui, who says the ginseng consortium has made him more "businesslike," believes that is changing. Scientists at Western and elsewhere are becoming more innovative, he says, savvy about the patent process and how to get their discoveries to consumers.

The process is very different from working in academia, "where "you're just sitting in a lab preparing your next experiment, (not) thinking about commercialization," Luis notes.

"It takes some guts."

**Ginseng, the 'man-root'**

In Chinese, ginseng is called "Ren Shen," which translates literally as "man-root." It's an apt name for a root that looks like a man and is believed to be good for every part of one.

Canadian researchers are trying to prove that North American ginseng is indeed a multi-purpose herb. Here is a taste of a few of the projects underway.

*Head* – In a series of clinical trials, researchers at Edmonton's Afexa Life Sciences have shown that Cold-FX, a proprietary extract of North American ginseng produced by Afexa, reduces the severity and duration of colds, possibly by increasing T helper lymphocytes.

*Heart* – Three physiology and pharmacology professors at the University of Western Ontario are looking at ginseng's effects on the heart. Qingping Feng has found that taking ginseng preventively can reduce the severity of heart attacks in mice. Morris Karmazyn has shown that ginseng reduces long-term heart failure in rats that have already had heart attacks. Ed Lui is looking at ginseng's ability to reduce high homocysteine levels in the blood, which contribute to atherosclerosis.

*Sex organs* – University of Western Ontario neurobiologist and professor Lique Coolen is studying erectile function and copulation efficiency in pre-diabetic male rats. She and masters student Matthew Barnes have found that ginseng, known as a natural aphrodisiac, improved the rats' diminished sexual ability.

*Immunity* – Joaquin Madrenas, a professor of medicine and of microbiology and immunology at the University of Western Ontario, has found that ginseng prepared in a water extract, such as tea or soup, increases the body's immune response after exposure to a microbe or a tissue injury. He is working with human cells.

*Obesity* – Working with obese mice, University of Guelph professor Marica Bakovic, a professor of human health and nutritional sciences, has found that ginseng stimulates enzymes that prevent the storage of lipids in the tissues, a process that could reduce obesity and prevent the development of insulin resistance.

*Blood* – Vladimir Vuksan, a professor in the nutritional sciences department at the University of Toronto, has been studying ginseng for more than 12 years. Most recently, he and his research colleagues at St. Michael's Hospital have found that a combination of North American and Korean red ginseng improves a marker of long-term blood sugar control and reduces blood pressure in patients with Type 2 diabetes.