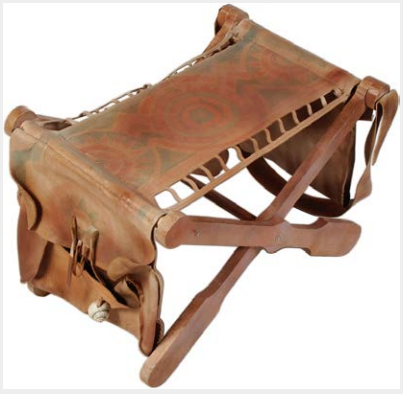
Earth-Friendly Leather

Forestry professor helps reduce environmental impact

Written by Randy Mertens · December 30, 2013



A University of Missouri School of Natural Resources researcher is helping a Kansas City company improve their new way to reduce the global leather processing industry's environmental impact.

Chung-ho Lin, research assistant professor and member of the MU Center for Agroforestry's Bioremediation and Phytochemistry

Program, is coordinating several MU disciplines at Mizzou to optimize the company's formula and production techniques. The company offers products that use biochemicals derived from probiotics, which displace many traditional chemicals used to process leather. Lin's group is using MU's expertise in analytical chemistry, bioinformatics, microbiology and molecular technology to help to improve the company's formulas.

Lin said the company's environmentally friendly products could rejuvenate the American leather tanning industry that has been largely shut down due to an inability to economically meet federal environmental standards.

Lin said his lab is benefitting from the collaboration as his students are getting hands-on training aligned with industrial needs. Also, he said, knowledge developed from the research can be applied to other R&D projects in his lab.

Chung-ho Lin.

Lin's research is among the most varied on the MU campus. He is working with scientists in the College of Veterinary Medicine to use the leaves of the Eastern redcedar tree as an effective MRSA – the flesh eating bacteria plaguing hospitals – treatment. Another project is looking at ways trees can soak up and degrade a variety of ground-polluting agrochemicals, veterinary pharmaceuticals and leftovers from munitions manufacture. He is finishing research showing how trees can be an effective windbreak in reducing the movement of odors from confined animal feeding operations.

Innovative Technology

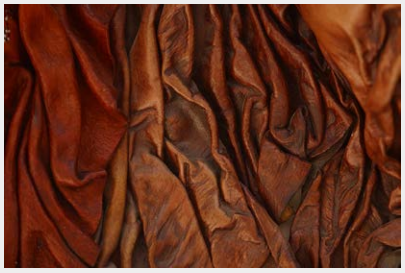
Proviera Biotech, the company Lin is working with, is a subsidiary of SCD Probiotics in Kansas City. Proviera was created last year to commercialize advanced probiotic and biochemical products to replace traditional chemicals used in the global leather processing industry.

Lin's collaboration started when SCD sponsored a Mizzou graduate student. "Dr. Lin was on one of his program committees," said Narin

Tipsrisukond, SCD Vice President of Technology and MU College of Agriculture, Food and Natural Resources (CAFNR) graduate. "At the time, SCD was looking for a lab to work with related to a tannery products characterization project. Because of Dr. Lin's expertise, I decided to contact him. In about 4-5 months we decided to collaborate."

Lin helps SCD on various quality assurance and quality control method developments for its tannery line of products. "The methods have been used in our current manufacturing programs to ensure the highest quality and consistency of products from batch to batch," Tipsrisukond said. "He did also provide testing services for general product properties. We also have a few other testing service projects under progress that are non-tannery related."

Tannery processes have generally remained unchanged for centuries, and there have been great recent advancements in the industry since its primitive beginnings. Wastewater treatment plants for effluent treatment are commonplace with tanneries, green chemical alternatives are readily available and while bad practices still exist they are not the standard.



"Despite these advancements there is still room for innovation, which is where our products come in," said Natalie Rada, Proviera Biotech's Senior Business Manager and CAFNR graduate. "Proviera's line of probiotic-derived products are competing in the $4.4 billion global tannery chemicals industry and provide unique benefits and advantages over current chemical and green-technology options."

Leather goods remain in high demand and highly regarded as a luxury item among consumers. "The leather industry uses a by-product from the meat industry and transforms it into a valuable and noble product that evokes a favorable emotional response in the mind of consumers," said Juan-Carlos Castell, Proviera Biotech's Technical Director of Sales. "It elicits feelings of esthetic pleasure and appeals to the visual, tactile and olfactory senses. The word leather is used to imply value and it is intended to transfer to the customer that the

article made with leather is durable, luxurious, unique and desirable."

The company markets several products, all of which are 100 percent biodegradable, including a degreasing agent, a hydrating and wetting agent as well as dispersing agent. Improved leather quality and yield, reduced operating costs, reduced environmental impact, reduced odor levels, reduced water consumption and reduced processing time are just a few of the benefits the products offer. Eighty percent of the firm's products are exported.

Yoghurt's Cousin

The use of probiotics is a novel approach in leather manufacturing. Probiotics are non-pathogenic strains of micro-organisms that are usually incorporated into the human diet to modify gut microbial ecology, alleviating such symptoms as diarrhea. Most people encounter probiotics in their yoghurt.

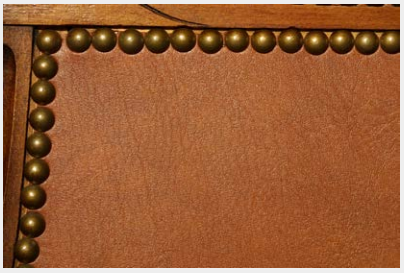
"When hides and skins arrive to the tanneries they contain a lot of substances that are not transformed into leather and need to be removed, but leave the main structured protein and collagen clean and ready for the tanning operations," said Castell. "These cleaning and soaking processes are called beamhouse operations. Dirt, blood, fat and other proteins, like keratin from hair, are eliminated by chemical treatments. In the tanning stage, the collagen from hides and skins is stabilized to become non-perishable. Certain mineral salts, tannins extracted from certain plants and other organic materials can be used for tanning. Before drying the already transformed leather, some chemical treatments like dyeing to confer color and fat-liquoring for softness are carried out. After drying, leather undergoes some mechanical operations and fine coatings to protect the leather and to achieve the last performances for the article to which the leather will be used."

Castell said that the company's products are derived from a fermentation process powered by probiotics and are applied mainly during the beamhouse processes.

"The properties of our biochemical products are designed in a way that allow the hides and skins to be rehydrated and recover the

original flexibility like when they were protecting the live animal," Castell said. "Also, they can remove most of the dirt and soluble protein that will not be transformed into leather and release and solubilize the natural fat. Chemical surfactants, pH adjusters, enzymes, salts and amines can be replaced successfully with our biochemicals while sodium sulfide during unhairing can be reduced. Effluents from beamhouse operations are the main contributors to tannery effluent loads because they carry most of the organic material from the cleaning operations as well as the chemicals. Proviera's products significantly reduce the toxicity of tannery effluent by displacing chemicals and also degrading the organic material released from the operations. Furthermore, our products effect on leather structure is less harsh compared to chemicals which helps to improve the quality of the final leather article."

A New Approach



SCD Probiotics was founded by Matthew Wood, who graduated from CAFNR in 1998 with a natural sciences degree.

Wood's interest in a sustainable future was fueled at an early age when his mother was diagnosed with Leukemia in 1989 and then passed away five years later. He believes the environment she lived in and foods she consumed had an adverse effect on her health. Concerns over current environmental and social problems led Wood to believe that the lifestyles practiced in most industrial societies is unsustainable.

Wood founded SCD Probiotics in 1998 after extensive study in the science of beneficial microorganisms. As part of his CAFNR undergraduate studies, Wood conducted primary research at EARTH College in Costa Rica, where he experienced first-hand the effect of beneficial microbes on banana plantations. He continued his research in biotechnology around the world, and received his Master's of Science degree at the University of Ryukyus in Okinawa, Japan.

In July 2011 Wood received an award from Poland's Minister of Agriculture and Rural Development for his contribution to soil science, and the delivery of a technology that revolutionizes the

ability to improve agricultural methods in sustainable and economically feasible ways.

Environmentally Friendly and Safer Products

SCD Probiotics Vice President of Technology, Dr. Narin Tipsrisukond , who earned his Ph.D. in Food Science from CAFNR in 2003, said the company offers products which are showing up in tanneries all over the world.

“The reception of our products in the market has been very positive and we intend to increase our footprint in the industry. Finished leather articles processed with our probiotic derived biochemicals are already in the hands of finished leather buyers and on consumer shelves in numerous regions around the globe” said Rada.

“This is a win-win for everyone,” Lin said. “The collaboration supports our teaching and research missions while assisting the economic development of an innovative biotechnology company in Missouri.”