Homegrown and Renewable: OARDC Tackles Foreign Oil ‘Addiction,’ Waste Management

Plant-derived fuels and industrial products play a key role in the U.S. plan to cut dependence on foreign petroleum by boosting production and use of domestic energy and feedstock sources. Ohio — abundant with agriculture and food-processing biomass; and a leader in chemicals, plastics, and rubber materials production — is perfectly positioned to help. Now, several OARDC initiatives are changing the chemistry of the state’s economy.

One initiative is the Ohio BioProducts Innovation Center (OBIC), which works to link the agbiosciences with chemical-conversion and advanced-materials technologies to create a high-quality, renewable supply of specialty industrial compounds such as plastics, paints, lubricants, and solvents.

To effect this change in Ohio’s economy, OBIC is bringing new technology to accelerate research in the areas of plant genetics, biomass processing, and chemical conversion. It is also focusing a part of the university’s soybean breeding program to look for traits and varieties targeted at industrial applications, which is expected to benefit farmers in the near future.

Through programs such as OBIC, OARDC is positioning itself as a leader in the emerging “integrated bio-economy,” OBIC Director Stephen Myers said.

Another initiative that’s turning up the voltage is the Biomass-to-Energy research project, whose purpose is to take animal manure (an environmental concern) and food-processing leftovers (an expensive waste-disposal issue) and convert them to clean, renewable energy. Benefit to the Buckeye State: Ohio’s biomass is capable of producing at least 65 percent of the state’s residential electricity needs.

This project explores two different technologies — biodigesters, which turn waste into biogas, and fuel cells, which can use that biogas and other feedstocks (such as soybean oil) to generate energy. Fuel cells are a technology in which Ohio is enthusiastically investing to become a national leader. And this OARDC project fits perfectly into the state’s plan, said animal scientist Floyd Schanbacher, one of the project leaders.

“The fuel cell industry would have never thought of themselves as interacting with agriculture,” Schanbacher said. “But OARDC’s decades of experience in anaerobic digestion have helped make this link between wastestreams, biodigesters, and fuel cells as a way to store and utilize renewable energy.”

Schanbacher’s system utilizes solid-oxide fuel cells developed by Cleveland-based Technology Management, Inc. This type of fuel cell can handle a variety of fuels that are not clean, which is the case of bio-renewables. “This makes solid-oxide fuel cells one of the best candidates for making fuel cells affordable,” Schanbacher said. The project will soon build a unique facility on OARDC’s Wooster campus, which will include a set of 1,600-gallon anaerobic digesters as well as solid-oxide fuel cells. Also planned is an industrial-sized facility that will allow industries to test their feedstocks and calculate their potential energy yield.

Both OBIC and the Biomass-to-Energy project were created thanks to Third Frontier grants totaling more than $13 million, plus federal funds. OBIC is also funded in part by the AgBiosciences Innovation Grant (ABIG) program, a joint venture between OARDC and OSU Extension.
A Natural Solution: Biocontrols, Genetic Markers Help Keep Food Supply, Environment Safe

Novel technology and internationally renowned experts team up at OARDC to keep dangerous enemies at bay — pests and plant diseases that could threaten our food supply and cause significant losses to the economy.

OARDC is taking advantage of the latest advances in genetics and genomics research to develop unique biological controls to fight devastating insect pests. Researchers are also finding genetic markers that improve our understanding of disease mechanisms that could pave the way to creating new management strategies to reduce crop losses.

Bio-controls are gaining popularity as consumer demand for organic foods and ecologically friendly pest- and disease-control methods grows. And genetic-marker technology is proving to be a very useful tool for the development of plants that are disease-resistant or more nutritious.

One example is the work of OARDC entomologist Parwinder Grewal, who leads a national project aimed at sequencing the genome of insect-parasitic nematodes — microscopic roundworms that are highly effective biological insecticides against a wide variety of pests. The project, funded at $1.8 million by the National Institutes of Health and the U.S. Department of Agriculture (USDA), could revolutionize biological control by boosting the effectiveness of nematodes as insect killers, increasing the number of their target pests and the environments where they could be applied, and making them cost-effective for use in high-acreage crops such as corn and cotton.

Such advances, Grewal said, could turn insect-parasitic nematodes, currently a $10-million industry worldwide, into a billion-dollar business. But more importantly, increased use of these biocontrol agents would help reduce the environmental and human-health risks associated with excessive use of chemical insecticides.

In another area of research, OARDC plant pathologist Sophien Kamoun is the key player in two national projects aimed at sequencing the genome of two devastating crop killers, Phytophthora infestans and Phytophthora capsici — fungus-like oomycetes that cause serious diseases in popular vegetables such as potatoes, tomatoes, and peppers. Funding for these projects, totaling $6.7 million, comes from the National Science Foundation, the U.S. Department of Energy, and USDA.

One of these pathogens, P. infestans (which was responsible for the Irish potato famine), has re-emerged as a pervasive enemy of potato and tomato production. With worldwide losses exceeding $5 billion a year, it has become the single greatest pathogenic threat to global food security. That's because potatoes are the staple food in many developing countries and the most important non-cereal crop in the world.

“Genome sequencing will allow us to compare these two species, see what their differences are at the molecular level, and learn what makes one infect one crop and not the other,” explained Kamoun, a global leader in oomycete molecular genetics and genomics. “This will open up many possibilities for research and ultimately new management options for growers, including disease-resistant varieties and new, more effective fungicides.”
Center for Diagnostic Assays Yields New Poultry Test: Even Better Biosecurity for a $3.3-Billion Ohio Industry

The AgBiosciences Innovation Grant (ABIG) program — a joint venture between OARDC and OSU Extension — was designed to transform discovery and knowledge into innovations that have positive economic, social, and environmental impacts, while contributing to local and state economies and promoting an entrepreneurial culture within the university.

Six Centers have been funded in part by ABIG — the Ohio BioProducts Innovation Center, the Center for Innovation Based Enterprise, the Center for Food Safety and Agrosecurity, the Center for Advanced Functional Food Research and Entrepreneurship, the Center for Urban Environment and Economic Development, and the Center for Diagnostic Assays.

Within the past year, the Center for Diagnostic Assays (CDA) took a big step toward reaching ABIG’s overall goal — the development of a first-of-its-kind validated real-time RT-PCR assay for the detection of very virulent infectious bursal disease virus (vvIBDV), a highly contagious disease of poultry that is causing major losses to this multibillion-dollar industry worldwide and is threatening to invade the United States.

“Until now, no validated rapid assay for the detection of all known vvIBDV strains existed,” said Daral Jackwood, a molecular biologist with OARDC’s Food Animal Health Research Program and CDA director. “In countries with vvIBDV, this assay is necessary for the effective monitoring and control of this devastating disease. In countries without the virus, the assay would be a first line of defense needed to prevent vvIBDV from entering domestic poultry operations.”

An international IBDV expert, Jackwood has more than 20 years of experience researching this disease and has previously developed and patented commercially available tests to detect variant IBDV strains. His experience and successful research record resulted in a direct request from veterinarians and scientists at the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) for a molecular vvIBDV assay. APHIS helped OARDC secure part of the funding for this work from the U.S. Poultry and Egg Association and granted the institution permission to obtain vvIBDV genomic material from all over the world. In fact, OARDC is the nation’s only facility authorized to work with such viruses.

The next step involves getting the test to market. Ohio State has invited inquiries from scientific companies interested in discussing a potential collaboration with the university to produce and market a vvIBDV real-time RT-PCR assay kit worldwide. The prospects for commercialization, Jackwood said, are very good.

Since vvIBDV can kill up to 80 percent of a flock, having this test is essential to keeping the poultry industry in the United States and Ohio viable. The United States is the world’s largest poultry producer and the second-largest egg producer and exporter of poultry meat, with an annual farm value exceeding $20 billion. And Ohio boasts a $3.3-billion poultry industry, one of the top in the nation.
Green and Not With Envy: OARDC Helps $4-Billion Green Industry Lead Growth in Ohio Agriculture

Agriculture in Ohio is not all about corn and soybeans. And folks involved in nursery, landscape, and retail garden center operations — known collectively as the green industry — know it very well. Their industry is one of the fastest-growing segments of Ohio agriculture, increasing 48 percent between 2001 and 2005, generating $4.13 billion in sales, employing 241,000 workers, and contributing $491 million in taxes.

To make sure it continues to bloom, OARDC scientists conduct innovative research that benefits the green industry in multiple aspects, from basic studies at the molecular level to applied projects dealing with pest control, greenhouse engineering, and more.

One example is the work of Michelle Jones, a floriculture molecular biologist with OARDC’s Department of Horticulture and Crop Science. Jones is studying molecular and biochemical ways to delay the degradation and death (also known as senescence) of plant organs, such as leaves and flowers. By understanding the regulators that control senescence, she and her colleagues hope to identify genes that could be inhibited to delay the process and increase the quality and shelf-life of flowering plants.

How is this research expected to benefit the green industry? Right now, post-production losses of ornamental plants due to premature senescence during shipping and retail sale can be as high as 30 percent. Creating plants with delayed senescence and increased quality would not only reduce these post-production losses — it could also increase customer satisfaction and encourage repeat sales.

“Senescence is a naturally occurring process for plants, but there are environmental stresses during sales and in the consumer’s home and garden that can accelerate the process,” Jones said. “Creating plants with delayed senescence is a potential benefit to floriculture and nursery professionals, as well as consumers, because the plants will last longer, keep their blooms longer, and will be hardier in the retail store or in the garden.”

Jones and her colleagues used petunias to study the effects of ethylene on senescence. Petunias are popular and important bedding plants that are highly sensitive to ethylene — a plant hormone and naturally occurring gas produced by many plants. Environmental stresses tend to trigger the release of ethylene, which causes premature degradation and death of both leaves and flowers.

Altered plants that resist the effects of ethylene — and produce flowers that last twice as long as normal flowers — are available to researchers. But these plants have decreased seed germination, decreased rooting, and increased susceptibility to disease, which makes them of limited value to the green industry. The key, Jones said, is to find a way to delay senescence without affecting other aspects of plant development. To accomplish this, Jones is identifying genes involved in flower senescence using a petunia microarray developed at Ohio State. The petunia microarray will allow researchers to identify hundreds of genes that increase in abundance as flowers die based on 4,400 petunia genes already identified and stored.

Jones’ studies could have quite a significant impact on Ohio’s economy. Wholesale value of floriculture crops in the state was more than $186 million in 2004, so even if post-production losses are conservatively estimated at 10 percent, premature senescence is costing Ohio producers and retailers more than $18 million per year — losses that could be reversed thanks to this OARDC research effort.
ABCs of BMPs: New Practices Help Clean Sugar Creek; Project/Community Teamwork Is Key

The Ohio Environmental Protection Agency ranks north-central Ohio’s Sugar Creek watershed — encompassing parts of Wayne and Holmes counties — as one of the most impaired in Ohio due to sedimentation, nutrient enrichment, bacterial contamination, and loss of riparian (streamside) habitat. But lately the tide has turned for the better. Farmers in the watershed now use at least 12 different Best Management Practices (BMPs) — practical, effective, scientifically proven ways to keep water clean and healthy — by teaming with OARDC’s Sugar Creek Watershed Project.

Started six years ago by OARDC’s Agroecosystems Management Program (AMP), the project combines science with the local community — farmers, residents, businesses, municipal officials, others — to tackle a complex challenge: improving environmental quality throughout the entire watershed. Greater use of BMPs — with details, assistance, and materials from the Project free or on a cost-share basis — stands as a key.

AMP’s Richard Moore, the head of the Project, says the practices, among other things, cut the amount of nitrates (the cause of “blue baby” syndrome), phosphorus (which fuels algal blooms), sediments (which turn water muddy), and bacteria (such as *E. coli*) that run off into the water. Yet they also help farmers and businesses to likewise boost their earnings.

One method, called the Late Spring Nitrate Test, let a watershed farmer slash his spending on nitrogen fertilizer by $3,000. Using the test, reports the *Journal of Environmental Quality*, can reduce how much nitrate gets into water by nearly a third.

Another BMP — livestock exclusion fencing — keeps farm animals away from streams, increases soil organic matter, increases biodiversity, and protects against wind and water erosion. Extra: A dairy farmer who worked with the project saw his milk quality soar (thus earning a price premium) and mastitis (infection of the udder) rate plummet after installing the fencing.

A third BMP, riparian buffers, has created at least eight miles of new, contiguous buffers in the upper part of the watershed alone. The buffers may stop about 75 percent of the nitrates that enter them and serve as a reservoir for phosphorus, keeping it from entering the stream. Moreover, Moore said, they yield a significant “symbolic role in connecting diverse farmer and non-farmer partners.”

Previously, “People in the watershed were not aware of the problem or didn’t think the stream was that polluted,” he said. “Now they have mobilized themselves to address the problem and try to do something about it.”

www.oardc.ohio-state.edu
http://oardcreport.osu.edu

Bringing Knowledge to Life
Responding to Emerging Threats: OARDC Tackles Exotic Organisms Menacing Agriculture, Natural Resources, Human Health

They cost the United States more than $100 billion each year. They have the power to disrupt our food supply, endanger agricultural production, and obliterate our most valuable natural resources. They could even put people’s lives at risk. And many are so tiny we can’t even see them.

Invasive species and emerging pathogens — from deadly viruses to destructive insects to resilient plant diseases — are a problem of national proportion. That’s why OARDC has put special emphasis on proactively responding to diseases and pests threatening Ohio and beyond by conducting unique research projects that tackle threats such as soybean rust, emerald ash borer (EAB), and avian influenza.

Since soybean rust was first discovered in the United States, OARDC and OSU Extension have established sentinel plots to monitor for the disease and looked for the most effective ways to apply fungicides. Soybean rust is an aggressive leaf fungus that can impact yields if left untreated or not treated properly. Rust hasn’t been found in Ohio, but experts agree that rust-resistant soybean varieties are the key to controlling this disease. That’s why OARDC plant pathologists and breeders have joined a nationwide effort to identify varieties that may exhibit resistant characteristics.

Another devastating invader is emerald ash borer, an insect from Asia that destroys native North American ashes and could potentially obliterate one in every 10 trees in Ohio. OARDC entomologist Dan Herms — a national expert on the tree-killing beetle that has been found in more than 20 Ohio counties since 2003 — leads a team whose goal is to identify EAB resistance mechanisms present in Asian ashes to facilitate selection and/or breeding of resistant trees for reforestation purposes in Ohio and other affected states.

Perhaps the most worrisome exotic organism today, avian influenza has captured international attention due to its ability to jump from birds into people and the fear it might spark the world’s next pandemic. In Ohio, OARDC virologists are looking for answers to two key pieces in the bird flu puzzle — what makes flu viruses capable of jumping from one species to another, and how to create a vaccine powerful enough, yet safe, to protect poultry against the disease and prevent further spread.

The second piece of the puzzle is what drives the work of avian influenza expert Chang-Won Lee. His lab is developing a live influenza vaccine that would give animals a more cross-protective and longer-lasting immunity compared to currently available vaccines — a less effective and more costly option for producers as the vaccine must be administered by intramuscular injection, one bird at a time.

“Live-virus vaccines can be developed faster to respond to emerging virus strains and can be administered via aerosol for faster, cheaper, and more effective control,” Lee said. “And the knowledge we gain in developing these vaccines for poultry can be applied to creating better vaccines for humans, too.”

The economic impact of OARDC’s efforts to fight invasive species and emerging pathogens could be enormous — soybean rust could cost Ohio growers $270 million, a fifth of the crop’s annual value, even if it only caused a 20 percent yield loss; emerald ash borer can potentially cost citizens and the state of Ohio more than $3 billion in the next 10 years; and an outbreak of highly pathogenic avian influenza could drastically hurt Ohio’s $3.8 billion poultry industry.
Examination of Welfare Reform Reveals Complex, Stressful Life of Working Poor

April Mouser is a shift manager at a Hardin County fast-food restaurant, earning $8.90 an hour. Though she works full-time, she gets no benefits — “no sick leave, no insurance,” she said. She feels lucky that while she’s working, her mother watches her four children, ages 14, 12, 10, and 8. “Hopefully, they’ll go to college,” she said.

This is the type of family that 1996 welfare reform legislation was designed to help, said Sharon Seiling, consumer sciences researcher with the Ohio Agricultural Research and Development Center.

“Clearly, welfare reform was an attempt to increase well-being,” Seiling said. “The feeling was that people would have higher incomes and be better off if they were in the workforce.”

Seiling has examined welfare reform’s impact on rural families as part of a 10-year national study, beginning in 1998. Since then, she and researchers in 13 other states have conducted three extensive interviews with 414 low-income mothers with at least one child 12 or younger.

Seiling has found that most participants live much more complex lives than “anyone with a standard job can imagine,” juggling work schedule changes and child-care arrangements and living under the constant stress of the working poor.

Seiling has examined welfare reform’s impact on rural families as part of a 10-year national study, beginning in 1998. Since then, she and researchers in 13 other states have conducted three extensive interviews with 414 low-income mothers with at least one child 12 or younger.

Seiling has examined welfare reform’s impact on rural families as part of a 10-year national study, beginning in 1998. Since then, she and researchers in 13 other states have conducted three extensive interviews with 414 low-income mothers with at least one child 12 or younger.

Seiling’s study corroborated evidence of the unique nature of the rural poor. For example, they often have work schedules that vary from day to day and week to week, and work that involves very early hours, second or third shifts, and weekends.

• Encourage more businesses to offer sick leave — the number that don’t is “staggering,” Seiling said. “Many of the mothers were fired when they had to take care of sick children.”
• Provide more opportunities for advancing education. “We found that if you have a child before you finish your education, it’s likely you’ll never get more schooling. Some can do it, but most say it’s just too much” trying to make ends meet.
• Extend access to health insurance, either through employers or by expanding government-sponsored programs, and broaden access to mental health care, often not available in rural areas. “Mental health is a huge barrier in getting work for many of these families,” Seiling said.
• Provide some type of public transportation. “Some communities have been creative, using senior-citizen vans to serve low-income workers getting to and from their jobs,” Seiling said. As Mouser knows full well, many rural areas have no public transportation, “not even a taxi,” Mouser said.
• Find ways to support family members who assist low-income parents day-to-day, or at least do more to publicize programs already available.
• Consider the benefits a higher minimum wage could have on low-income families, or expand the Earned Income Tax Credit. “That’s a big benefit — most families used it to pay bills.”

Additional information is available at http://fsos.che.umn.edu/projects/rfs.html.
Science on the Road: OARDC Reaches Out to Schools in Times of Budget Crunch

For years now, OARDC has made science more exciting for Ohio K-12 students by offering different hands-on educational programs on its Wooster campus. In fact, one such program alone, The Science of Agriculture, attracted 924 kids in 2006 — 446 more than in the previous year. Despite the encouraging numbers, many schools haven’t been able to take advantage of OARDC’s educational activities because of budget cuts. So OARDC researchers found another way to bring science to life for these kids.

“In the past year or so, more and more teachers and schools who have made a yearly trip to OARDC for one of our special events or just for a class tour or field trip have had to cancel their visits because of funding constrictions,” said Jane Houin, OARDC administrative public relations liaison. “That got us to thinking, with more and more schools under the gun financially, how can we continue to meet their needs and get these students excited about the opportunities in agbiosciences?”

So if kids couldn’t come to OARDC for science, OARDC would take science to them.

That’s how OARDC on the Road, a pilot program to do just that, got started in the winter of 2005-06. Schools with limited field-trip opportunities were encouraged to submit applications to have OARDC bring a hands-on science learning experience to their classrooms. In its first year, the program reached more than 800 elementary and junior-high students from different types of schools — from urban schools in Mansfield (with 100-plus students per grade) to schools like Winesburg Elementary (with only 15 students in its entire sixth grade) — who learned about the science of pollination, soybeans, coyotes, and watersheds.

One of those students was Chaz Hairston, a seventh grader from Mansfield’s John Simpson Middle School. He participated in one of the most popular activities of the pilot program — learning about watersheds. With his classmates, Hairston constructed a watershed from simple household materials; painted on neighborhoods, roads, and fields; added “pollutants;” and evaluated what happened when a rain episode washed everything down.

“It was fun! I liked it that we got to build our own watershed and learn about it in the process,” Hairston said. “The workshop “taught me a lot about agriculture and our natural resources. I learned that things like fertilizers and car oil can affect the water, and also learned what we can do to help the county and the land.”

Teachers also appreciate the benefits this outreach effort provides by enhancing their pupils’ science curricula.

“Schools are short on money for anything extra like expert speakers on topics we study,” said Bonnie Putman, science teacher at John Simpson Middle School. “So we depend on organizations like OARDC for free speakers who will come and engage our science students in activities that bring understanding to topics we study throughout the year. In the future, we would like to schedule return visits to our school.”

The program was so successful, OARDC will visit 24 schools during the 2006-07 school year. In the meantime, Houin said, more and more applications keep coming from teachers and administrators. Science is in hot demand. And OARDC is ready to supply a good dose of it.
Solving the Mystery: How *Listeria* Enters People’s Homes, Kitchens, Lives

Pam Steele was 38 and eight months pregnant in 1990 when she battled what she thought was a severe case of flu. The diagnosis: listeriosis, caused by the microorganism *Listeria monocytogenes*. Steele’s daughter was stillborn, and Steele nearly lost her own life.

“I had had problems getting pregnant, but everything seemed to be going OK,” said Steele, of Cambridge. “It was devastating. I couldn’t help but wonder, where did I get this? That’s the scary part. We never figured it out.”

Now, Steele is helping researchers solve such mysteries.

Lydia Medeiros and Jeff LeJeune, food safety scientists with the Ohio Agricultural Research and Development Center, have teamed up with Colorado researchers in a $600,000 study to examine how *Listeria* might enter people’s homes and kitchens.

During their study’s first six months, the researchers signed up 27 of 50 households they want to examine. Half of the families live on dairy farms or around five or more cows, sheep, or other ruminant animals, which tend to shed *Listeria* in their feces.

“Are farm families more exposed to *Listeria monocytogenes*? Are farmers bringing their work home with them — literally — on their clothing? If that is occurring, how can we interrupt the pattern?” Nonfarm rural households act as controls. The researchers use molecular biology to conduct DNA sequence analysis of any *Listeria* bacteria they find to help determine if *Listeria* found in different places comes from the same source.

Medeiros said patterns are emerging. “We’re discovering what the most important factors in controlling *listeria* are,” she said. “Next year, we’ll teach participants how to control factors that put them at risk, and in the third year we’ll go back and reassess. There has never been a study to do this.”

Now 54, Steele has a 10-year-old son — the result of a pregnancy many thought wasn’t possible after her bout with listeriosis. She is proud to participate. “When I saw the notice in the newspaper, I knew immediately I would sign up. What’s important is finding information that can help someone else.”
Scientists Seek Good Health with Disease-Fighting ‘Functional Foods’


Work on functional foods could bring not only good health, but good business. Battelle estimates the U.S. market for functional foods at $18 billion.

But health is more on the minds of these scientists. In one example, an interdisciplinary team of food, horticultural, medical, and dental researchers is studying whether black raspberries can stop or slow the biological processes that lead to oral, esophageal, and colon cancers.

Steve Schwartz, OARDC professor of food science, has extracted anthocyanins from black raspberries to study how they act in the body. His work supports that of researchers Gary Stoner and Chris Weghorst in the College of Medicine and Susan Mallery in the College of Dentistry in examining the uptake of anthocyanins into oral tissues.

In a collaboration with cancer researcher Steve Clinton, Schwartz isolated compounds, called glucosinolates, from broccoli sprouts that may fight bladder cancer. During chewing and digestion, these phytochemicals become substances called isothiocyanates, which, when tested in the lab, had a profound effect against three forms of bladder cancer, including the aggressive human invasive transitional cell carcinoma.

In other studies, Schwartz has found that partnering vegetables with healthful fats, such as those in salad dressing or in avocado, helps the body absorb phytochemicals such as beta carotene, lycopene, and other carotenoids.

“People are being encouraged to eat more vegetables, many of which are very high in carotenoids and extremely low in fat,” Schwartz, said. “But we’re finding it takes at least a little fat to help the body increase absorption of many of those carotenoids.”

 Anything that reduces incidence of cancer could have a vast effect: The American Cancer Society predicts Ohio will see more than 24,000 deaths, 61,000 new cases of cancer in 2006, while the National Institutes of Health puts the overall costs for cancer in 2005 at $209.9 billion, including $74 billion for health expenditures and $17.5 billion in costs of lost productivity.

But functional foods also may have an impact on other chronic illnesses — heart disease, hypertension — even cataracts. Human nutrition researchers Josh Bomser and Mark Failla have examined phytochemicals lutein and zeaxanthin, abundant in leafy green vegetables such as kale, spinach, and collard greens. They’ve found these substances reduce damage brought on by ultraviolet light that can cause cataracts. Each year, 1.2 million cataract surgeries across the United States cost consumers more than $3 billion in health-care costs.