



biological sciences

Bioscience investigators in Ohio are accessing vast amounts of genetic, clinical, imaging and environmental data to individualize the diagnosis and treatment of disease. For instance, researchers employ a tool in the fight against cancer in the form of a web portal that correlates tumor images with their corresponding genetic codes. Neonatal specialists in large cities use high-definition videoconferencing to examine critically ill newborns at rural hospitals. And, medical residents train in virtual environments, improving surgery techniques and saving money. In addition to health care, the application of bioscience to agriculture, energy and industrial products are growing in importance. The bioscience industry in Ohio employs more than 1.2 million workers and contributes an annual statewide economic impact of \$146 billion, according to BioOhio, a nonprofit industry association. The following pages illustrate just a few examples of cutting-edge research in the biosciences supported by the computational resources of the Ohio Supercomputer Center. ■



photo courtesy of Nationwide Children's Hospital

above: Neonatal specialist Rachel Brown, M.D., and Chief of Neonatology Stephen Welty, M.D., at Nationwide Children's Hospital consult with a pediatrician at Adena Regional Medical Center, via high-definition videoconferencing, to evaluate distressed newborns in the largely rural community.

Growing telemedicine trend impacts smallest of patients

Stacie Traylor delivered her tiny baby five weeks prematurely because of complications from gestational diabetes. Concerned doctors at Adena Regional Medical Center in Chillicothe, Ohio, informed Stacie that little Emilie had suffered a collapsed lung. They were considering moving Emilie 45 miles north to Nationwide Children's Hospital in Columbus, where top neonatal specialists could treat her.

The doctors reconsidered the move and chose a different, more innovative approach to caring for Emilie. Through a pilot project with the Ohio Supercomputer Center, both hospitals had positioned sophisticated cameras and monitors in their nursery facilities and established a high-definition video connection through the fiber-optic channels of the Broadband Ohio Network. With the equipment in place, the specialists observed sharp, colorful video of the baby and consulted with her Adena doctors, ultimately determining that Emilie could safely be treated in Chillicothe, near her loving, worried parents.

"Telemedicine dramatically increases the care of our youngest patients," said Dr. John Fortney, medical director for Adena Health System. "If we're looking for help with a diagnosis, someone from Children's—whether it's a neonatologist or a sub-specialist, such as a pediatric cardiologist—will see the patient and speak to the attending physician in real time.

"Before, information was relayed by telephone, which meant it was subject to interpretation," he said. "With high-definition videoconferencing, specialists can make a more thorough evaluation."

Adena Regional Medical Center was selected for the pilot project because the hospital sends more



above: Doctors at rural medical centers employ advanced videoconferencing technologies to access specialists who can help determine if a distressed newborn must be transported to a more advanced, but distant facility. Here, John Radford, M.D., a pediatrician at Adena Regional Medical Center, confers with Drs. Brown and Welty at Nationwide Children's Hospital in Columbus.





Nowhere is the need for broadband greater than in rural health care, where isolated clinics can save lives by using advanced communications technology to tap the expertise of modern urban medical centers.



photo courtesy of Nationwide Children's Hospital

left: High-definition videoconferencing equipment allows specialists — such as Nationwide Children's neonatologist Dr. Rachel Brown — to view distressed newborns with exceptional clarity, examine detailed x-rays, view lab results and consult with attending physicians in real-time.

far left: Often, in the case of distressed newborns, the mother and families often are unable to accompany the child to distant advanced medical centers. Because of high-definition videoconferencing consultations, newborn Emilie Traylor could receive in Chillicothe the care she needed, and stay close to her mom, Stacie.

pediatric patients to Nationwide Children's than any other outside of the Columbus metropolitan area. In their first year of operation with telemedicine, physicians were able to make quicker and more accurate clinical assessments via videoconferencing, especially regarding the need to transfer these critical-care newborns. The number of neonatal transports from Chillicothe, which cost thousands of dollars for each trip, has been reduced to half since the network consultations were introduced.

"If a baby needs to be moved to our facility, doctors have seen the child, reviewed their diagnostic images and can prepare for the infant's care as soon as he or she arrives," said Dr. Stephen Welty, chief of neonatology, Nationwide Children's Hospital. "Just as importantly, we also use this as a tool to determine if a baby doesn't need to be transferred. Then, the child can stay with family and avoid unnecessary stress."

In the successful wake of the Adena project, engineers at the Ohio Supercomputer Center are working with doctors at Nationwide Children's to expand the neonatal program to rural medical facilities in Portsmouth, Zanesville, Findlay and Marietta.

OSC engineers for several years have been playing a major role in the deployment of high-definition videoconferencing systems, in areas such as education, health care, judicial courts and entertainment. In addition

to the neonatal project, OSC has conducted studies of HDVC usability and reliability at two university game research and design labs, an organ-transplant services facility and a renowned music school.

These advances coincide with a growing national trend toward universal access to telemedicine. Recently, the Federal Communications Commission's Rural Health Care Pilot Program awarded \$417 million to 69 regional network projects around the nation to "significantly increase access to acute, primary and preventative health care in rural America." Three of those projects provide high-speed connections to health care facilities in nearly half of Ohio's 88 counties.

These regional networks will link to the Broadband Ohio Network backbone to transport intra-state data traffic and connect with Internet2, the primary national research and education network in the country.

"Broadband deployment is one of the Commission's top priorities — particularly in rural America," the FCC said in a release. "And nowhere is the need for broadband greater than in rural health care, where isolated clinics can save lives by using advanced communications technology to tap the expertise of modern urban medical centers."

Once these high-tech health care delivery systems are in operation, heart-warming success stories — such as little Emilie's — should be more commonplace. ■

Project leads: Nationwide Children's Hospital, Adena Regional Medical Center & OSC

Research title: Medical collaboration network demonstration project on OSCnet

Funding source: American Distance Education Consortium & Ohio Board of Regents