PHOTO CONTRIBUTED

MICROBIOLOGIST LIZZIE J. HARRELL, a Shallotte native, is on sabbatical this year from Duke University Medical Center, learning the latest lab techniques for molecular biology at another lab in Durham.

SHALLOTTE NATIVE CONSIDERED AN EXPERT IN HER FIELD

Lizzie Harrell: Waging Quiet War In The Laboratory

Editor's Note: This story is a slightly edited version of a story that appeared in the January 1993 issue of NCSU Alumni Magazine. Reprinted with permission. News Editor Susan Usher contributed to this story.

BY DEE SHORE

In October 1957 all attention turned skyward as the Soviet Union launched the Earth's first artificial satellite. Half a world away, young Lizzie Johnson of Shallotte launched a dream of some day being a scientist, of helping others by exploring a world impossible to find or measure with the unaided eye.

Today the young dreamer is known as Dr. Lizzie J. Harrell, and the world she explores is not the vast universe of stars and planets. Rather, it is the tiny but just as complex universe of bacteria, fungi and parasites she sees through the microscopes in Duke University Medical Center's microbiology laboratory in Durham.

Harrell, an associate medical research professor of microbiology, teaches in Duke's medical school and leads the laboratory's bacteriology section. A diplomate of the American Board of Medical Microbiology, she is recognized as being an expert in her field.

Harrell's job requires the inquisitiveness of a detective and the tenacity of a warrior. With little more than a blood sample, a swab from a wound or a piece of tissue obtained in an operating room, Harrell must figure out if a microorganism is causing a patient's illness, and, if so, which of thousands of microorganisms it is. Then it's her job to suggest antibiotics to destroy it before it has a chance to destroy the patient.

With Duke's reputation as one of the nation's leading research and teaching hospitals, patients come there from hundreds of miles around. Oftentimes they are the sickest of the sick, suffering from the most puzzling ailments.

"We have patients who are referred here after they've been to their family physicians or community hospitals, and they still aren't getting well," Harrell says.

"They come from as far away as New York or Florida. And if they come here and an infectious process is found, then our laboratory is the one that is called upon to try to identify the microorganisms causing the infections.

"I would venture to say that there are very few places in the world where one would see a larger variety of different microorganisms than we see here."

For that reason, the work of Duke's microbiology lab is all the more important. An unusual microorganism that is found there will likely be found later in other hospitals, she says, and any information she can share about her lab's findings can save other labs time and money and, most important, can save lives.

Harrell's lab is tucked off Duke Medical Center's beaten path. It is a gleaming, busy place filled with the increasingly complex instrumentation that is transforming the field of clinical microbiology. Under the direction of Harrell and three other section heads, 30 or so technicians work amid anaerobic chambers, computer screens and high-powered microscopes.

Harrell is at home here. She moves easily from one workbench to another, chatting with the technologists, offering them guidance based on more than 20 years of experience in microbiology labs.

She points to a plate speckled with salmon-colored lumps. These, she explains, are bacterial colonies grown from a sample taken from an AIDS patient with pneumonia.

In 1984, when her lab found the bacterium, technologists had difficulty identifying it. By testing it, they determined it was Rhodococcus equi, a bacterium commonly found in horses. Up to that point, the microorganism had been reported in only 12 people.

With the spread of AIDS, the number of patients infected by the bacterium has increased. Harrell published her findings in a clinical microbiology journal, and she has traveled halfway across the country to discuss the findings with her peers.

Such information exchange is crucial to helping cure disease and stem its spread. And, at a time, when bacteria seem to be transforming faster than ever, it is becoming even more crucial.

One of the major challenges facing Harrell and other clinical microbiologists is an onslaught of new drug-resistant bacteria that cause infections. Such resistance poses particular problems for hospitals, where up to a third of the patients are taking antiobiotics.

The development of agents to kill harmful bacteria transformed medicine in this century, allowing doctors to prevent some infections, to cure others and to slow the spread of some diseases.

But as each potential lifesaving drug was introduced, bacteria caught on, throwing up a barrier to the drug. Today, such antimicrobial resistance has reached a level that one National Institutes of Health adviser has called epidemic. And the epidemic is a costly one in terms of both lives lost and money spent.

Tests to determine whether a microorganism is susceptible to the usually prescribed therapy may take hours or days after the isolation of a specific bacterial agent, so the possibility of complications—or death—arises. Also, the substitution of newer and more expensive antimicrobial agents for drugs to which organisms have become resistant increases the cost of medical care, as does the increase in morbidity associated with such infections.

According to Science magazine, "having to cycle through drug after drug to find one that will kill a patient's resistant bug adds between $100 million and $200 million a year to the nation's medical bill."

Experts have warned that neither drug companies nor the federal government has mobilized to the extent needed to combat the drug-resistant bugs. So the job of dealing with antimicrobial resistance falls in large part on clinical microbiologists such as Harrell.

At Duke, Harrell discourages the development and spread of drug-resistant bacteria in several ways. She and the technologists in her lab strive to make rapid diagnoses so that the correct antimicrobial agents are prescribed, and they pass along findings about resistant microorganism to the hospital's infection-control team so that they might act to avoid spreading a resistant bacterium from one patient to the next.

Also, Harrell and other faculty members meet daily with the hospital's infectious diseases physicians, discussing their lab's findings and encouraging them to prescribe antimicrobials selectively so that antibiotic resistance doesn't develop.

More recently, Harrell has taken up the topic of antimicrobial resistance as a special area of her research. By publishing findings early, microbiologists believe that they might be able to head off the spread of resistance genes.

Part of her research involves testing new drugs. "As resistant bacteria emerge, I like being able to analyze new antibiotics to see what is still available for treatment," Harrell says.

The high-tech lab from which these significant findings emerge at Duke seem light years from her first home, where her interest in science was sparked.

> *"I like things that give me a challenge—where I can see something happen and I can ask the questions, 'Why did this occur? How can I investigate?'"*
>
> —Lizzie J. Harrell

Born in Shallotte, it was here that she first earned a reputation as a scholar, her desire to please her teachers at the former Union High School drawing her further and further into academic pursuits. And it was here that learning about Sputnik 1 made her determined to focus those pursuits on science.

"I think my interest in science was sparked when Russia sent up the first sputnik Everywhere on the news the emphasis was on science, science.

"And I remember as a high school student, my cousin Allene Johnson taught me chemistry. Her being my cousin made a greater impression, though all of my science teachers were excellent. Overall I had excellent teachers in all areas."

"I was just fascinated watching her go through all the chemical reactions. There was never any doubt in my mind that some area of science was where I wanted to be," Harrell recalls.

"I like things that give me a challenge—where I can see something happen and I can ask the questions, 'Why did this occur? How can I investigate? Let me apply the scientific method.'"

Though Lizzie's parents, Etta Gore Johnson of Supply and the late James Henderson Johnson, lived modest lives and weren't college educated, they wanted something better for their children.

"When I was working on the farm, I always knew, and my parents knew, that I would go to college," Harrell recalls.

In 1961 she left Shallotte for N.C. Central University in Durham, to study biology.

"It wouldn't have been possible for me without the federal student loan program—that's why I urge students to pay those loans back, so that opportunity will continue to exist for others."

After graduating with honors she went to Newark, Del., to work in pharmaceutical research for DuPont, analyzing specimens from animals that had been given experimental drugs.

After three years there she decided she wanted to continue her education. Her experience at DuPont had piqued her interest in microbiology, and, with her husband, Sampson, studying medicine at the University of North Carolina at Chapel Hill (UNC-CH), she knew her life would be spent around hospitals. So the clinical side of microbiology seemed a natural career choice.

After earning a master's degree in bacteriology and immunology at UNC-CH and working in the infectious diseases lab at a Veterans Administration hospital in Washington, D.C., for 2 1/2 years, Harrell came to N.C. State University in Raleigh in 1975, receiving her doctorate in microbiology in 1978.

Her subsequent career has resulted in a 13-page vitae that is sprinkled with evidence of her desire to help others. That desire extends beyond her job. Sandwiched between listings of the hospital committees she's served on are mentions of her work as a mentor for minority students interested in science and her work as a youth leader at her church.

Between listings of professional lectures with titles such as "Characterization of four beta lactamase-positive ampicillin-resistant enterococci isolated from blood cultures" are speeches titled "Preparation for Careers in the Sciences" and "Clinical Microbiology—What is It?"—lectures geared to junior and senior high school students.

On top of all this, she spends time with her son, Kendal, a 1992 N.C. State computer science graduate now employed as an assistant systems analyst in computer graphics at SAS Institute in Research Triangle Park.

"I love children," says Harrell. "I think that stems from my childhood, being from a large family and trying to be a mentor for younger members of my family, says Harrell, the oldest of 13 children.

Often Harrell is asked why, with her scientific prowess and her love of people, she didn't choose medical school.

"The laboratory was more to my liking than was working directly with patients," she answers. "I know that I am doing something to help someone, even though I do not deal one-on-one with the patient.

"I feel more comfortable being behind the scenes."

Presently Harrell in on a year-long sabbatical from Duke, working at a laboratory in Durham which is affiliated with both Duke University Medical Center and the Veteran's Administration Hospital.

"This is very convenient for me not to have to move, to be able to stay here with my family." she said. "Everything I need to learn is available right here."

The arrangement allows her to learn the latest laboratory techniques related to molecular biology, while keeping up with and publishing results of her ongoing research at the Duke lab.

The pace of her life is fast, but it's one on which Harrell appears to thrive. "It does keep me busy, but I'm loving every minute," she said. "There's never a dull moment!"