DNA Chips Spot and Help Track Antibiotic Resistance

A DNA chip, or DNA microarray, is a small glass slide that can reveal the presence or absence of particular DNA sequences in a sample. This tool has allowed clinicians to test for genetic mutations and diseases in people.

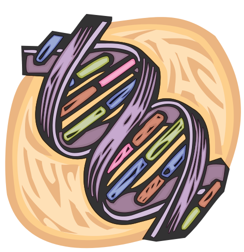
Now, ARS microbiologists Jonathan Frye, Charlene Jackson, Mark Englen, and Paula Cray have developed a DNA microarray that detects more than 100 antimicrobial-resistance genes in many types of bacteria.

Antimicrobial compounds, or antibiotics, have been used for years to fight bacterial infections. But some bacterial pathogens, like *Salmonella, Escherichia coli, Campylobacter,* and *Enterococcus,* are becoming resistant to more antibiotics. Scientists need to know which bacteria are resistant to which antibiotics and how the bacteria continue to develop resistance to other ones.

"We use DNA chips to detect genes that make bacteria resistant to antibiotics," says Frye. "Unfortunately, DNA that confers resistance can sometimes be exchanged when a lot of bacteria are together. Some exchanges are random, some are programmed, and some are brought on by stresses in the environment."

Frye and associates in the Bacterial Epidemiology and Antimicrobial Resistance Unit in Athens, Georgia, also use microarray technology to track resistant bacteria in samples collected from animals on the farm or in slaughter facilities. "This information will help identify possible targets for intervention strategies to prevent development and transfer of bacterial resistance," says Frye.

"The great thing about DNA microarrays is that we can search for many genes at once in any particular sample," he says. "Before, we had to put bacteria in a growth media laced with antibiotics. The bacteria that grew were resistant to that antibiotic. Then we'd search for the gene or genes responsible for the resistance. But now we'll know which genes could be responsible if they are expressed, because they'll show up on the DNA microarray.



"If you identify the source of resistance genes in bacteria, then you can begin tracking where the resistance is coming from and develop an intervention strategy. Sources of resistant bacteria could be soil, other animals, or even humans who handle the animals on the farm. The DNA microarray gives us a place to start."—By **Sharon Durham,** ARS.

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New Prairie Grasses To Fatten Cattle—and Producer Profits

Beef-cattle gains of up to 50 pounds per head should mean more money in the bank for animal producers in the Central Plains and Midwest, thanks to two new varieties of big bluestem prairie grass that ARS and university scientists have jointly released.

The beef gains come from grazing trials in eastern Nebraska that compared the new releases—Bonanza and Goldmine—to existing cultivars Pawnee and Kaw, which have been the leading big bluestems in the region for more than 40 years. Their long reign stems from their adaptability to a wide range of growing conditions. Such adaptability is especially important on marginal cropland used for cow-calf operations, whereby beef cows draw nutrients from forage rather than grains.

The problem is, Pawnee and Kaw weren't specifically bred with forage quality in mind, notes Kenneth P. Vogel, who leads ARS's Wheat, Sorghum, and Forage Research Unit, in Lincoln, Nebraska.

Goldmine and Bonanza offer the best of both worlds, combining wide-ranging adaptability with better forage quality, adds Vogel, who began breeding the big bluestems in 1977. He collaborated with ARS Lincoln scientist Robert B. Mitchell and University of Nebraska-Lincoln researchers Terry J. Klopfenstein and Bruce E. Anderson to field-test the grasses.

In pasture trials from 1999 to 2003 in eastern Nebraska, cattle that grazed the new big bluestems gained 18 to 50 pounds more per acre per year than those that grazed Pawnee and Kaw. The researchers estimate these gains could mean net-profit increases of $15 to more than $35 per acre a year for beef producers. And on marginal cropland, yearling steers that grazed pastures of Goldmine and Bonanza generated more net profit per acre ($65) than would have been made from growing corn on the same land during the same years.

Certified seed will become available in 2006. Vogel hopes the big bluestems will give beef producers a sustainable way to earn more income from marginal cropland.—By **Jan Suszkiw,** ARS.

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