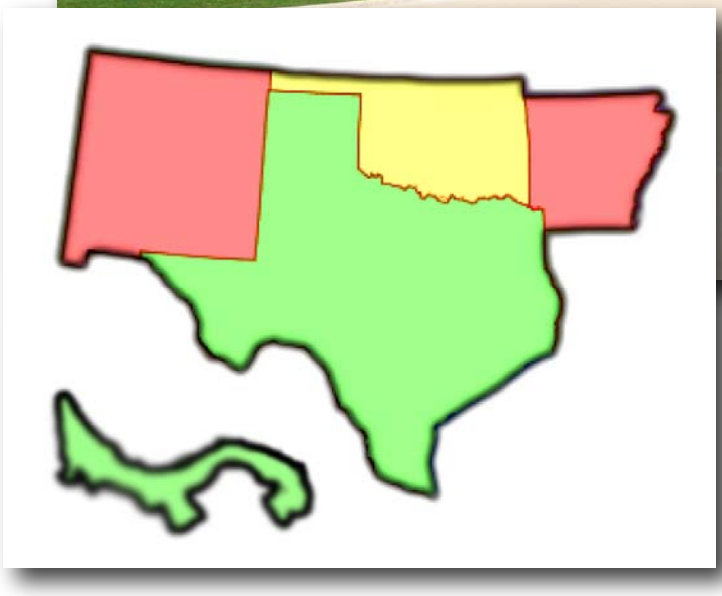
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN PLAINS AREA



SCIENCE FOR A PRODUCTIVE AMERICA

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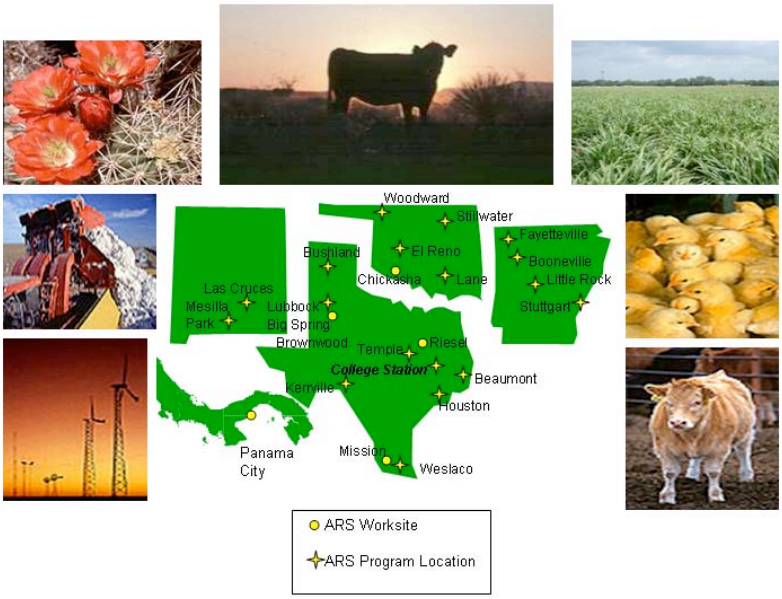
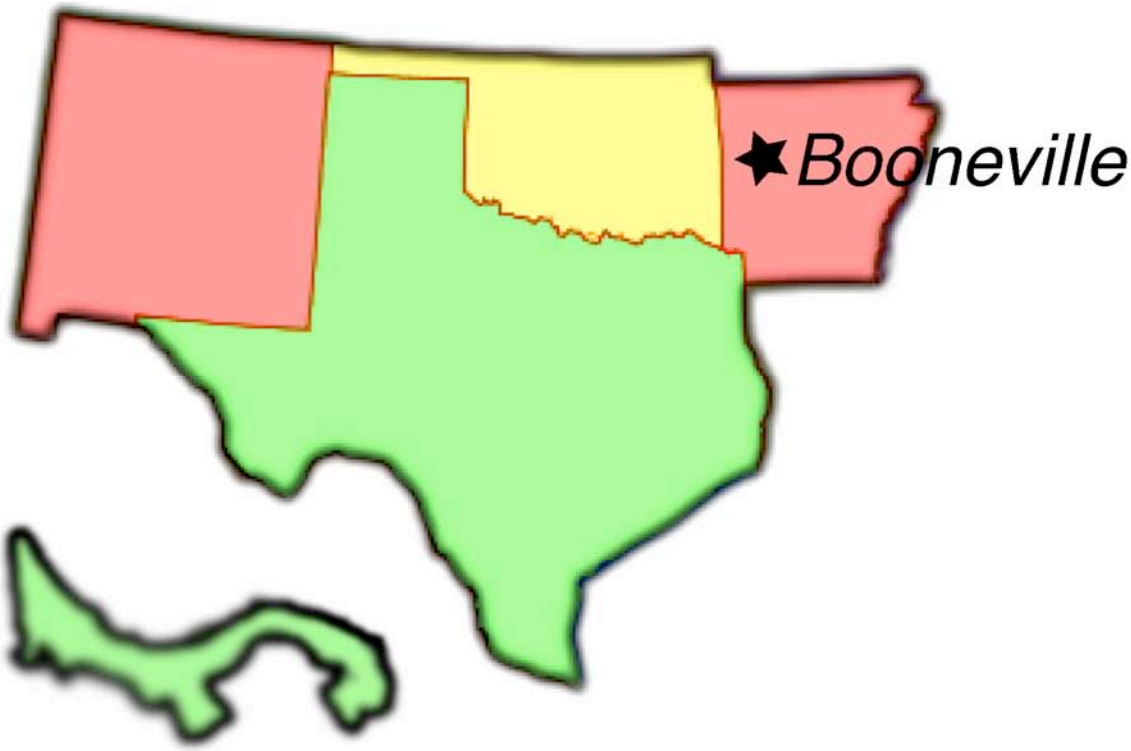
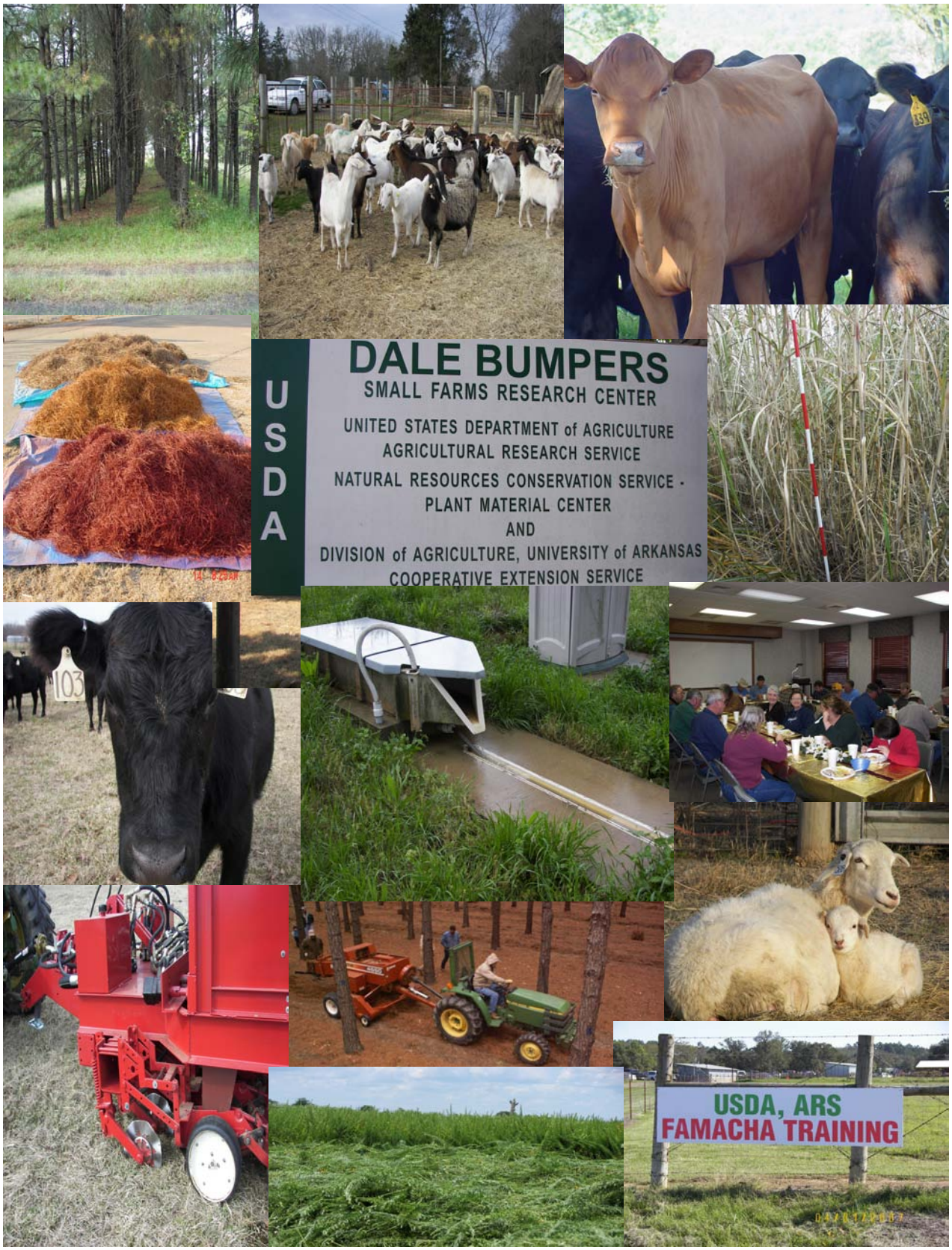


As a world-leading scientific research agency of the United States Department of Agriculture, the Agricultural Research Service (ARS) has a multifaceted mission. The ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provides access to and dissemination of this research nationally and internationally. ARS research helps to ensure high-quality, safe food and other agricultural products, and assess nutritional needs. The ARS mission includes research to sustain a competitive agricultural economy, enhance the national resource base and the environment, and provide economic opportunities for rural citizens, communities, and society as a whole.

ARS' Southern Plains Area is a region comprising the four states of Arkansas, New Mexico, Oklahoma, and Texas, as well as one international site located in Panama City, Panama. The environment of the region is very diverse– from an almost subtropical climate with nearly 55 inches of annual rainfall in the eastern part of Arkansas to a desert climate with less than 10 inches of annual rainfall in New Mexico. This climatic diversity lends itself to research diversity as well. We are the only Area that has active research programs in all of the ARS National Programs. In terms of size, we have approximately 220 Research Scientists and another 650 support staff in 17 locations.

SOUTHERN PLAINS AREA


Booneville


USDA
DALE BUMPERS
SMALL FARMS RESEARCH CENTER
UNITED STATES DEPARTMENT of AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
NATURAL RESOURCES CONSERVATION SERVICE -
PLANT MATERIAL CENTER
AND
DIVISION of AGRICULTURE, UNIVERSITY of ARKANSAS
COOPERATIVE EXTENSION SERVICE
USDA, ARS
FAMACHA TRAINING

SUBSURFACE APPLICATION OF POULTRY LITTER IN PERENNIAL PASTURES

Researchers at the Dale Bumpers Small Farms Research Center developed a prototype subsurface applicator known as the “ARS Poultry Litter Subsurfer”. This machine can transport 5 tons of dry untreated poultry litter directly from a poultry house and apply it under the surface (3-inch depth) of perennial pastures and other no-till systems. When compared to conventional surface application of litter, this new method can protect water quality by preventing more than 90% of nutrient losses in surface runoff, prevent ammonia nitrogen loss to the atmosphere, increase crop yield by retaining nutrients and water in the soil, and control odor problems. The Subsurfer also provides more precise control of litter application rates, including very low rates that are not feasible with conventional litter spreaders. For additional information, contact Dr. Dan Pote (dan.pote@ars.usda.gov).

PINE AGROFORESTRY AND GRASS BIOFUELS

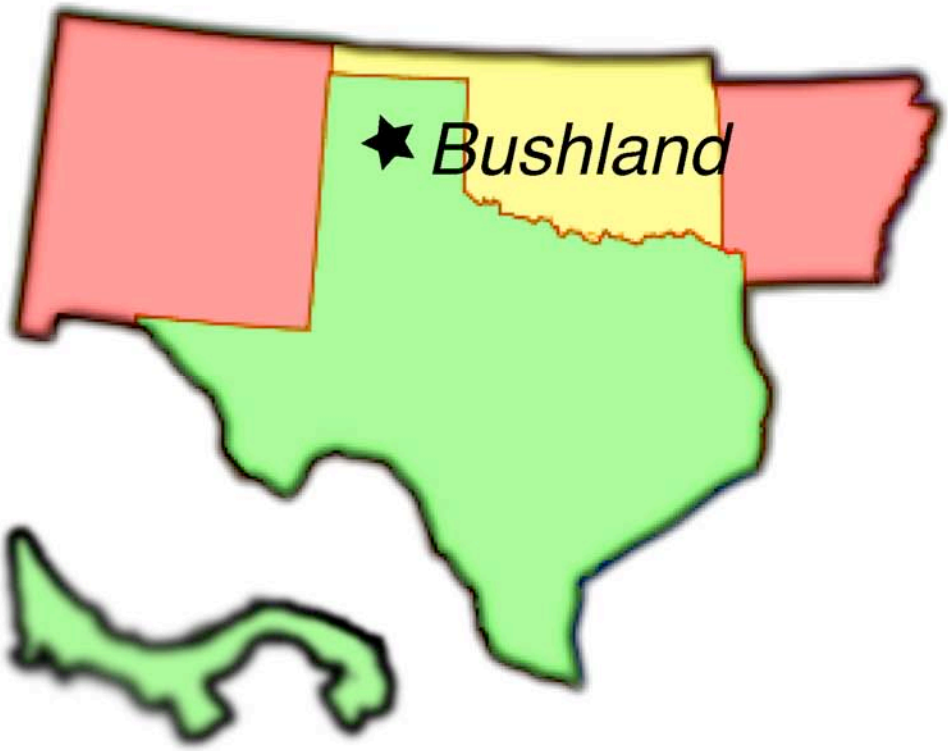
Pine Agroforestry – (see photos above) Determined effects of tree spacing, nitrogen fertilizer, alley crop-tree-pine straw harvesting, and tillage providing information on best management practices for pine agroforestry.
Cold Tolerant E-Cane Identified – (see photos below) Identified two clones of sugarcane identified from Florida that overwintered in west-central Arkansas, stem yield of one clone compared favorably to switchgrass. Hundreds of additional clones are being screened in collaboration with ARS-Houma, Louisiana. Stubble cold tolerance could expand the production range of energy cane to more northerly zones. For additional information, contact Dr. David Burner (david.burner@ars.usda.gov).

INTEGRATED CONTROL OF GASTROINTESTINAL PARASITES IN SMALL RUMINANTS

Research at Dale Bumpers Small Farms Research Center examines whole-system biological-based alternatives to chemical dewormers for control of internal parasites in sheep and goats in response to dewormer resistance. Integrated strategies include use of copper oxide wire particles, sericea lespedeza, resistant genotypes, rotational grazing, and the FAMACHA system. For additional information, contact Dr. Joan Burke (joan.burke@ars.usda.gov).

ENHANCING CATTLE REPRODUCTION AND PERFORMANCE

Research at the Dale Bumpers Small Farms Research Center assesses the nutritional and physiological mechanisms of reproduction in beef cattle. Influence of forage type and body energy reserves of cattle is communicated between the brain and the reproductive system via metabolic hormones. Insulin-like growth factor-I, a hormone important to reproduction, as well as calving rates are decreased in thin cows grazing toxic tall fescue. Best management practices are being developed to increase reproductive efficiency of cattle. By increasing the number of calves each year in the U.S. by 10%, the same amount of beef could be produced with 12% fewer cows and a corresponding savings of almost $450 million dollars annually. For additional information, contact Dr. Michael Looper (mike.looper@ars.usda.gov)


Bushland

CROP EVAPOTRANSPIRATION AND ENERGY BALANCE

Research at the Conservation and Production Research Laboratory over 20 years has measured the water use and energy balance of most irrigated and dryland crops in the Southern High Plains. These data have been the scientific basis for the High Plains ET Network that has saved over 2 million ac-ft of water annually in cooperation with Texas AgriLife Research and Texas AgriLife Extension Service and many collaborative projects with other ARS laboratories, many universities, and visiting scientists. Contact Dr. Terry Howell (terry.howell@ars.usda.gov) for additional information.

IMPROVING APPLICATION STRATEGIES AND RESIDUE MANAGEMENT PRACTICES FOR USE WITH DEFICIT IRRIGATED CROPS

Researchers at the Conservation and Production Research Laboratory seek to adapt residue management practices from dryland crop rotations for use with deficit irrigated crops in an effort to maximize crop use of precipitation and irrigation water by limiting evaporative losses and improving the crop microclimate. Using crop simulation models in combination with field experiments researchers also evaluate irrigation application strategies that increase the efficiency of crop water use and subsequent yield under limited water cropping systems. Contact Dr. Louis Baumhardt (r.louis.baumhardt@ars.usda.gov) for additional information.

OGALLALA AQUIFER PROGRAM

Approximately 80 to 100 scientists from two ARS locations (Bushland and Lubbock TX) and four universities are researching issues related to the suitability of agriculture and rural communities who use water from the Ogallala Aquifer in western Kansas and Texas High Plains. The Program is developing technologies and knowledge that will enable agriculture to use water from the aquifer more efficiently and to identify policies that will enhance groundwater conservation while attempting to mitigate impacts on local rural economies. Contact Dr. Dave Brauer (david.brauer@ars.usda.gov) for additional information.


MESA

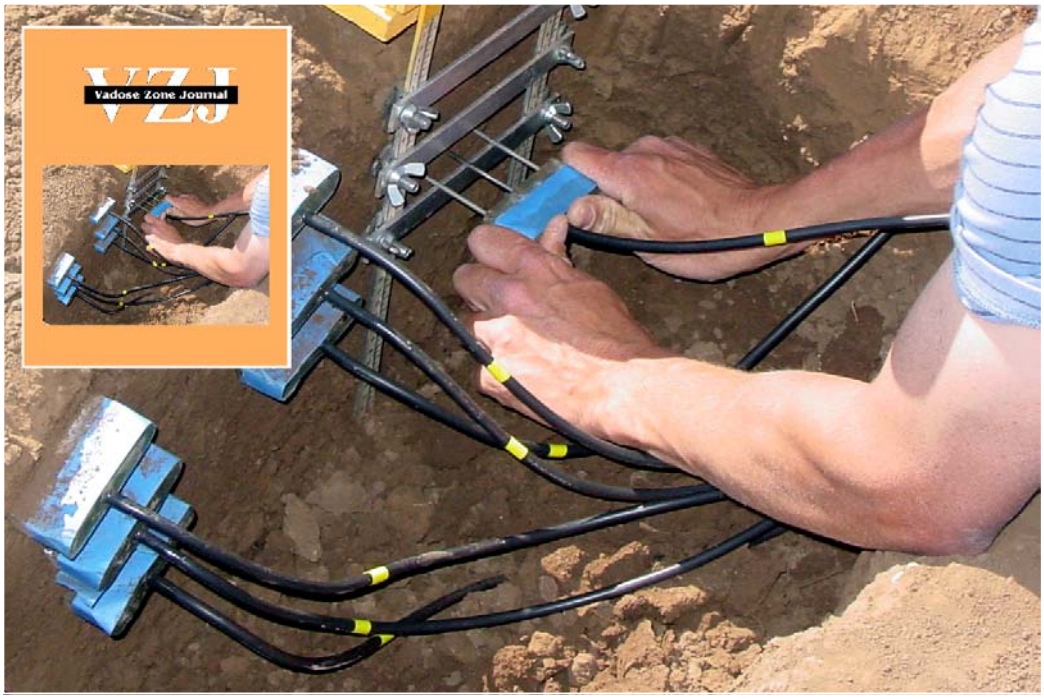

LESA

CROP RESPONSE TO SPRAY, LEPA, AND SDI

Researchers at the Conservation and Production Research Laboratory have evaluated and compared crop response, soil temperature, and soil moisture using advanced irrigation methods including Mid-Elevation Spray Application (MESA), Low-Elevation Spray Application (LESA), Low-Energy Precision Application (LEPA), and Subsurface Drip Irrigation (SDI). Crop response and soil moisture were also evaluated for alternative SDI bed designs and lateral installation depths. Contact Dr. Paul Colaizzi (paul.colaizzi@ars.usda.gov) for additional information.

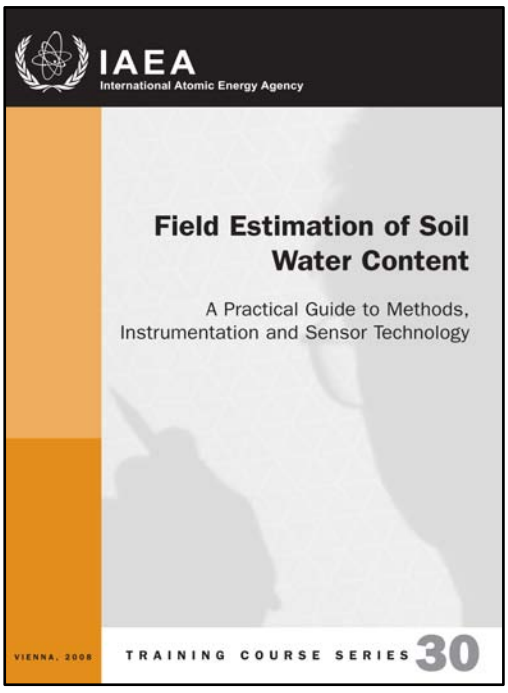

LEPA

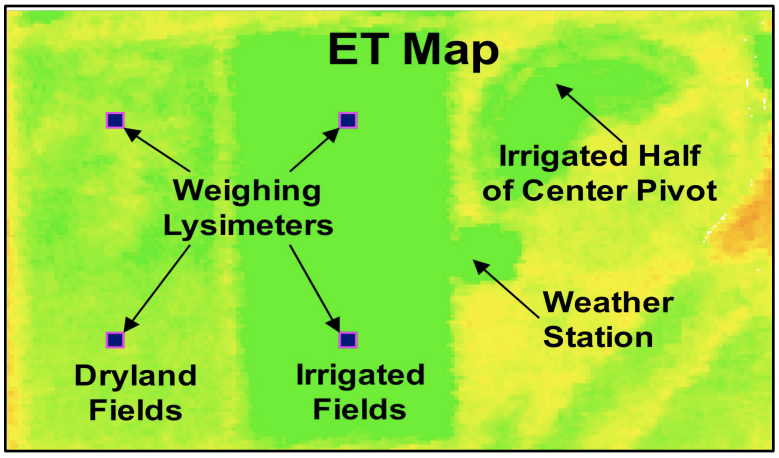

SDI



INTERNATIONAL EFFORT IMPROVES SOIL WATER MEASUREMENT

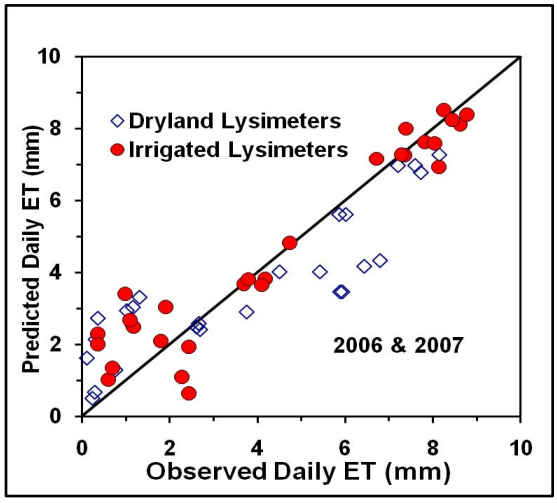
Research at the Conservation & Production Research Laboratory in cooperation with the International Atomic Energy Agency and researchers in seven countries determined the relative accuracy of soil water sensing systems, why some were inaccurate, and developed a guide to using them. Contact Dr. Steve Evett (steve.evett@ars.usda.gov) for additional information.

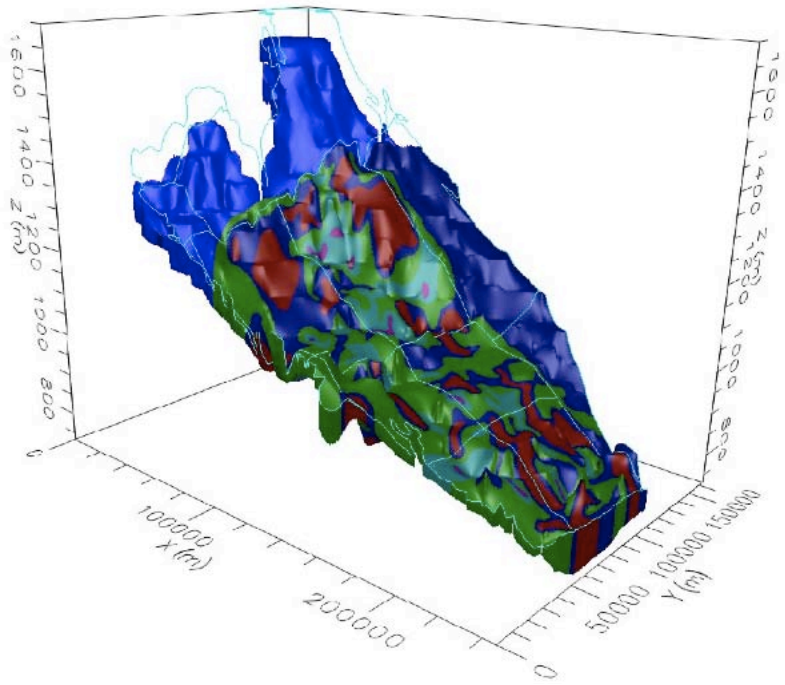




ET MAPPING IN THE TEXAS HIGH PLAINS

In the Texas High Plains, high-resolution daily ET maps would greatly improve irrigation management. Researchers at Conservation and Production Research Laboratory are developing an operational remote sensing based methodology for the Texas High Plains that uses energy balance algorithm models for mapping regional ET at temporal and high spatial resolution. Contact Dr. Prasanna Gowda (prasanna.gowda@ars.usda.gov) for more information.





MODELING THE OGALLALA AQUIFER USING MODFLOW

Researchers at Conservation and Production Research Laboratory are developing a groundwater model for a 4-county area (Dallam, Sherman, Hartley, and Moore counties) in the Northwest region of the Texas High Plains. The overall study is a major component of a comprehensive regional analysis of Ogallala aquifer depletion study with a purpose of understanding short- and long-term effects of existing and alternative land use scenarios on groundwater changes. Results are expected to be useful to develop and evaluate strategies to conserve groundwater in the Ogallala aquifer beneath Northern High Plains of Texas and improve regional water planning. Contact Dr. Jairo Hernandez (jairo.hernandez@ars.usda.gov) for additional information.

CENTER PIVOT AUTOMATION AND CONTROL

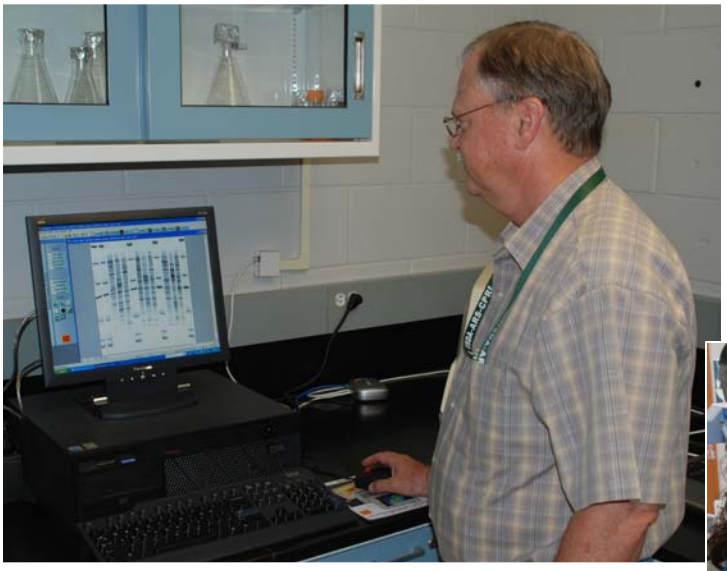
Irrigation management research at the Conservation and Production Research Laboratory includes automatic irrigation scheduling and control of center pivot systems using wireless sensor modules and networks. Real-time measurement of crop canopy temperature and microclimatological data are being used as inputs to calculate a daily stress index and irrigation trigger for efficient use of irrigation water. Contact Dr. Susan O'Shaughnessy (susan.oshaughnessy@ars.usda.gov) for additional information.

TILLAGE EFFECTS ON SOIL WATER DYNAMICS AND CROP WATER USE

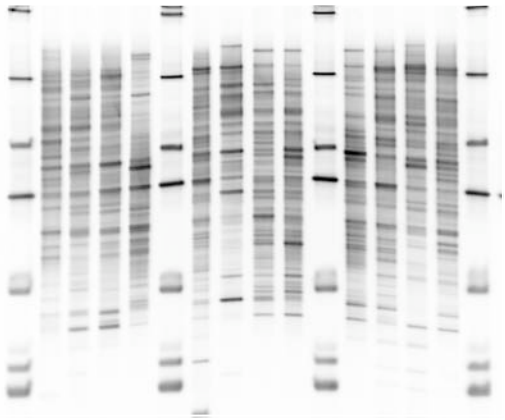
Researchers at the Conservation and Production Research Laboratory are investigating the effects of tillage on near surface soil hydrological processes and water use by dryland crops. The studies are used to evaluate soil water management decisions and optimize crop utilization of limited rainfall. Contact Dr. Robert Schwartz (robert.schwartz@ars.usda.gov) for additional information.

INTERACTIONS BETWEEN SOIL, PLANT, AND THE ENVIRONMENT AFFECT CROP YIELD

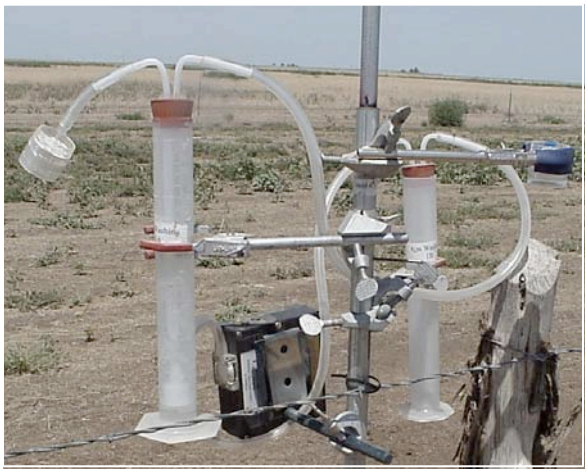
Research at the Soil-Plant-Environment Research facility has shown how a soil's ability to hold and release water can increase or decrease grain and lint yields under deficit irrigation in a similar climate. The facility has a rain shelter and 48 weighing lysimeters which contain one of four contrasting soil types: clay loam, silt loam, sandy loam, and fine sand. Contact Dr. Judy Tolk (judy.tolk@ars.usda.gov) for more information.



FEEDLOT PEN SURFACE SOIL MICROBIAL COMMUNITY COMPOSITION AND FUNCTIONALITY



Research at the Conservation and Production Research Laboratory has identified shifts in microbial composition associated with beef cattle production and distiller's grain based diets. Feedlot layers significantly affected bacterial and fungal community composition including the distribution of different lineages of ammonia- and nitrite-oxidizing bacteria (N cycling). The wet-pack layer had a significant reduction in fungal community composition when compared with the other feedlot pen surface layers. Escherichia coli O157:H7 was primarily confined to the unconsolidated and dry-pack feedlot pen surface layers and was not observed within the wet-pack layer. Microbial community composition of the unconsolidated layer (where fresh feces and urine deposition occurs) may be affected by grain diets fed to beef cattle. Corn and sorghum distiller's grain based diets resulted in significant shifts of the fecal microbial community structure when compared with the traditional steam flaked corn diet. Contact Dr. Bill Rice (william.rice@ars.usda.gov) for additional information.



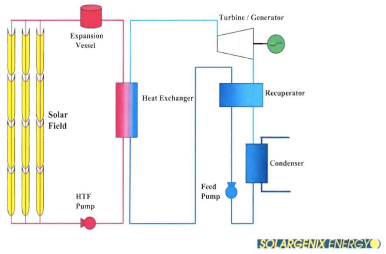
INTEGRATED MANAGEMENT TO REDUCE ENVIRONMENTAL IMPACT OF LIVESTOCK MANURES

The composition of the diet fed to finishing beef cattle can affect animal performance, the quantity of nutrients that enter and leave the feedyard and the losses of ammonia, methane and nitrous oxide from the feeding operation. The research focuses on developing dietary and animal management techniques to optimize utilization of feed nutrients and decrease losses of nutrients in water or the air. These are evaluated through combinations of animal performance, nutrient metabolism, respiration calorimetry, and lab-scale in vitro experiments. The effects of newer by-product feeds, such as distiller's grains are of particular interest. Contact Dr. Andy Cole(andy.cole@ars.usda.gov) for additional information.

1 MW Wind Turbines on 59m Tall Towers (White Deer, TX, 2002)

Parabolic Trough, Nevada (2007, 65MW)

Schematic of 1MW Solar Trough Power Plant

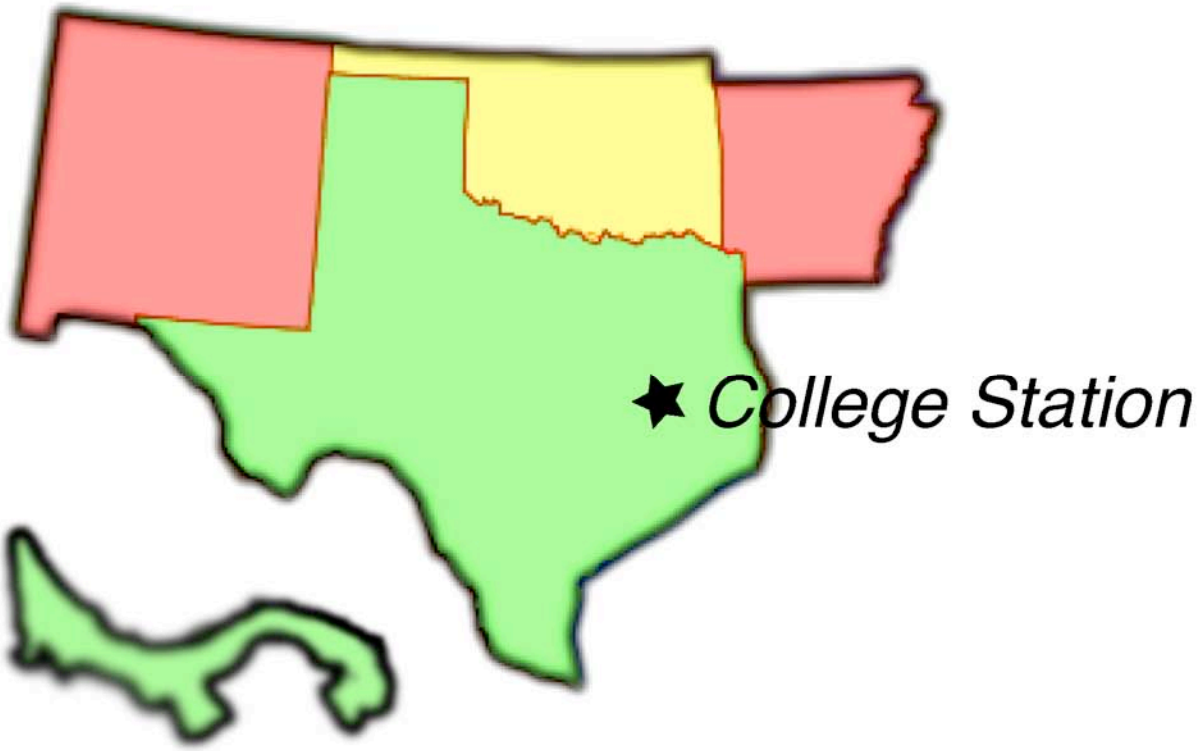


COMBINING SOLAR POWER PLANTS WITH WIND FARMS

The Renewable Energy Manure Management group has been studying ways to increase the renewable energy percentage of electricity in Texas. The best way found so far to meet the Texas electrical load with renewable energy is to combine solar power plants with wind farms. The addition of solar to wind improves the daily, seasonal, and peak electrical demand versus just wind alone. Although Texas has the most installed wind capacity of any state in U.S. (8500 MW as of July 2009), there have not been any solar power plants installed. To estimate the output of a solar thermal power plant, direct normal irradiance (DNI) data are required. We are currently collecting DNI data with a pyrheliometer mounted on a solar powered tracker. We plan to compare the DNI measured data to global irradiance data collected with pyranometers that have been corrected to DNI using equations developed at the National Renewable Energy Lab (NREL). For more information contact Brian Vick (brian.vick@ars.usda.gov).

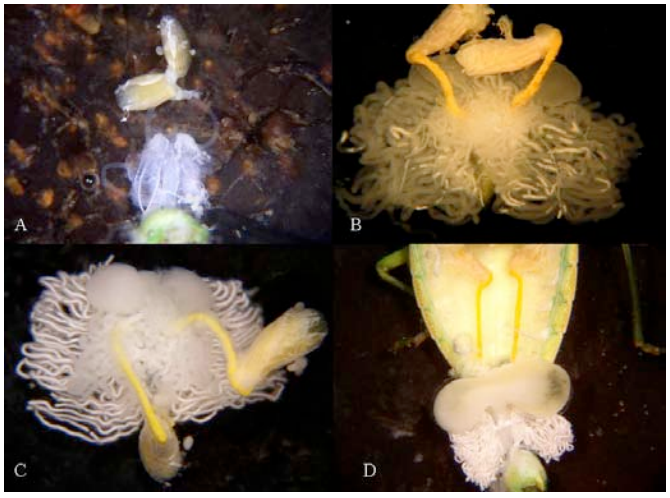
METHANE AND AMMONIA EMISSIONS FROM FEEDYARDS

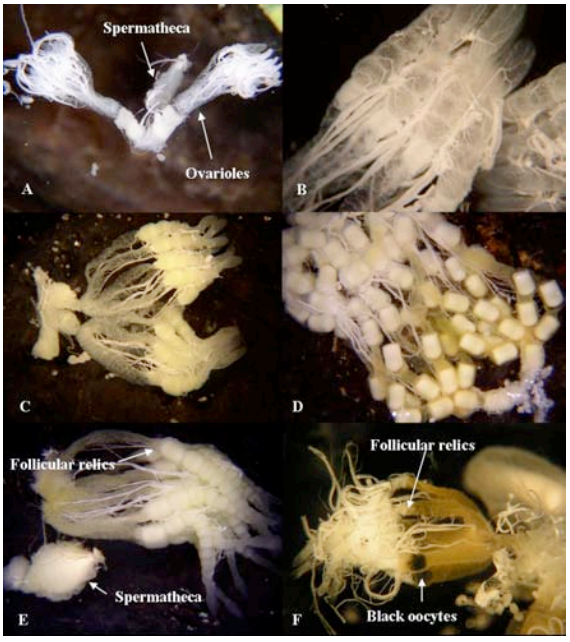
Methane is a potent greenhouse gas, and ammonia can negatively impact air quality and ecosystem health. Both gases are emitted from beef cattle feedyards. Scientists at the Conservation and Production Research Laboratory use open path lasers to measure methane and ammonia concentrations over feedyards, and an atmospheric dispersion model to calculate emissions of the gases. Coupled with estimates of the feedyard nitrogen and carbon balances, researchers have gained a deeper understanding of the dynamics of methane and ammonia emissions and the contribution of feedyards. Contact Dr. Rick Todd (rick.todd@ars.usda.gov) for additional information.

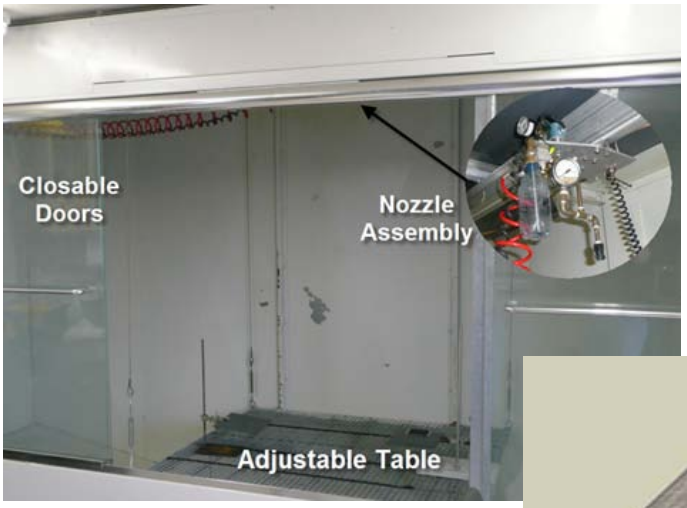

College Station

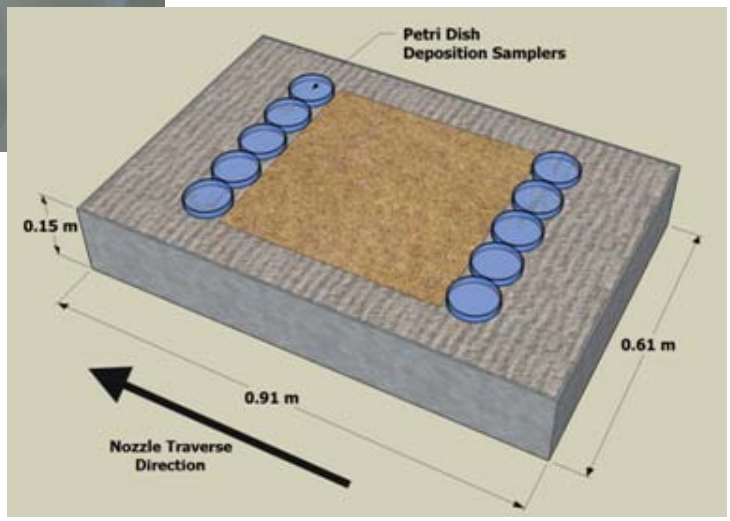
IMPROVED VISUALIZATION OF THE SOUTHERN GREEN STINK BUG REPRODUCTIVE SYSTEM

Researchers at the Southern Plains Agricultural Research Center are developing cornerstone visuals and descriptions of southern green stink bug female (at right) and male (below) reproductive systems. These images are critical in assessing reproductive status and potential of this important cotton pest and related species. For additional information contact Dr. Jesus Esquivel (jesus.esquivel@ars.usda.gov).



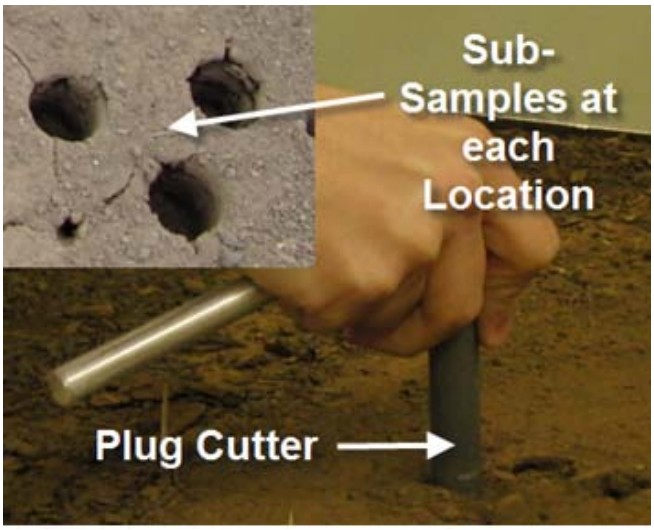


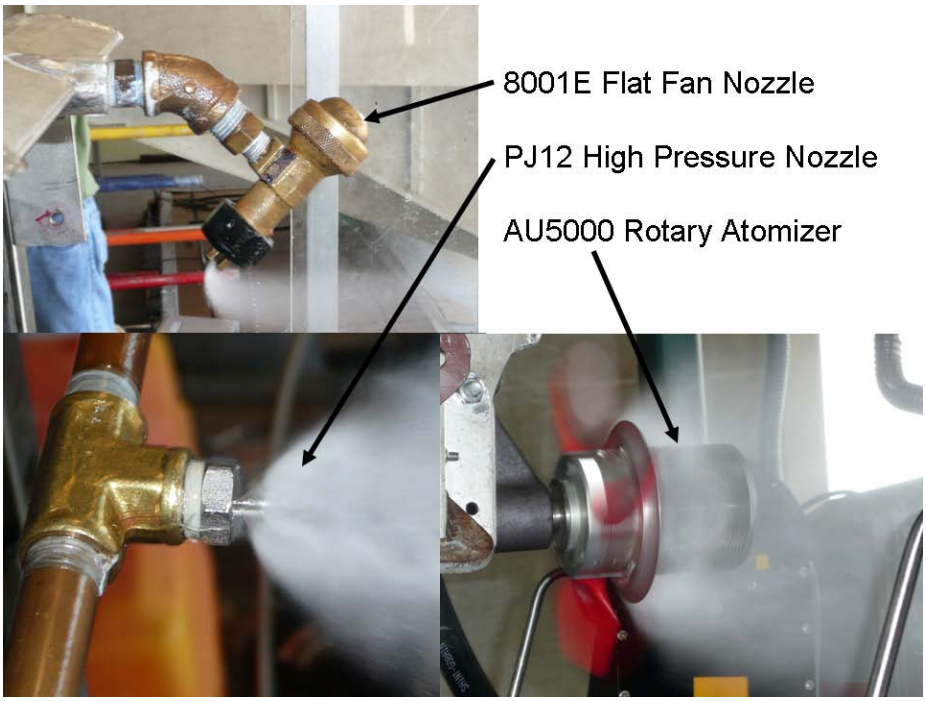




VOLATILE ORGANIC COMPOUND EMISSIONS FROM AGRICULTURAL SPRAY APPLICATIONS

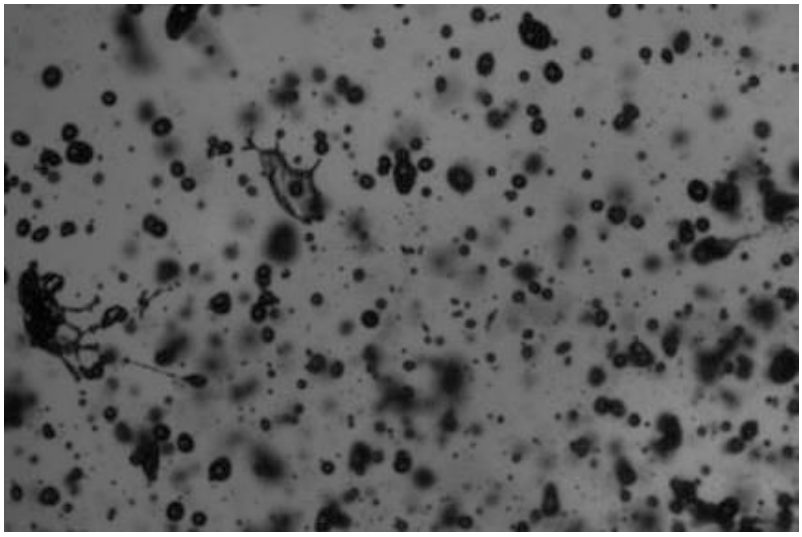
Researchers at the Southern Plains Agricultural Research Center are developing laboratory methods to determine volatile organic compound emissions associated with applications of agrochemicals. For additional information contact Dr. Brad Fritz (brad.fritz@ars.usda.gov).

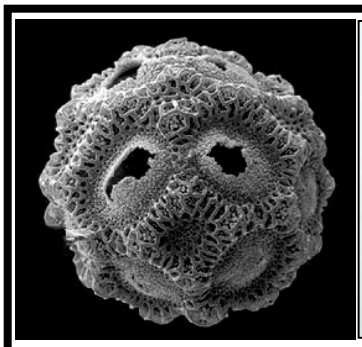




SPRAY FORMULATIONS AFFECT DROPLET SIZE IN HIGH SPEED AIRSTREAMS

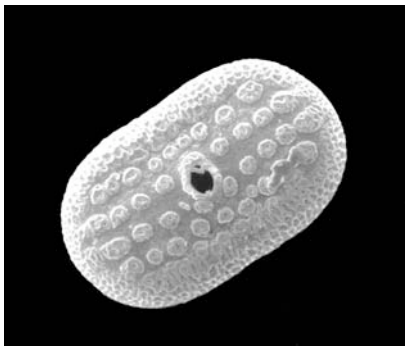
Researchers at the Southern Plains Agricultural Research Center investigate the effects of different spray formulations and nozzles on spray droplets generated under aerial application conditions to optimize product efficacy and mitigate spray drift. For additional information contact Dr. Clint Hoffmann (clint.hoffmann@ars.usda.gov).



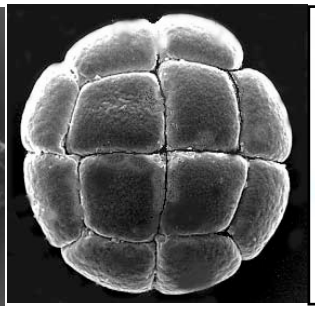
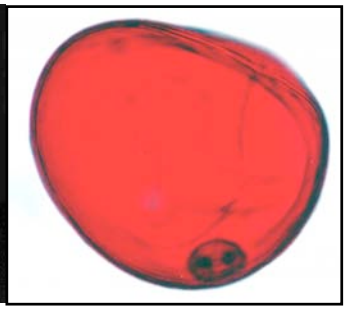


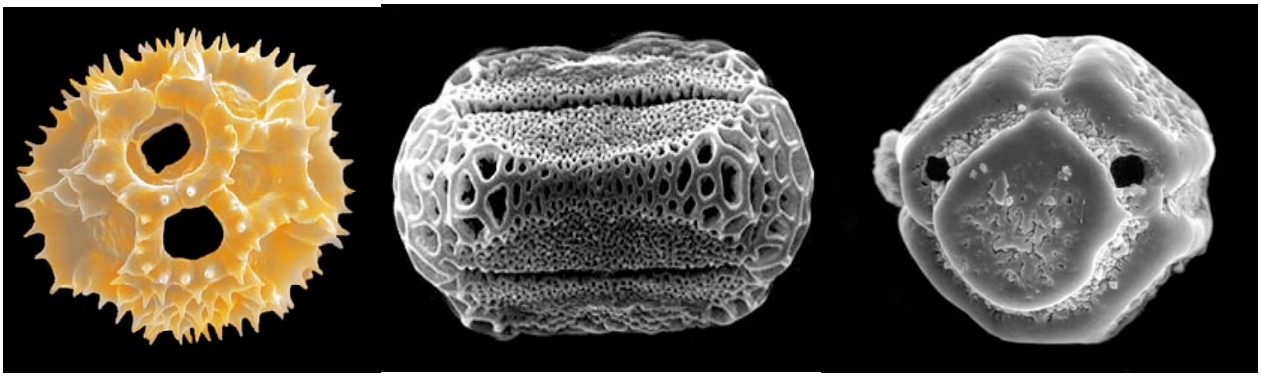
POLLEN, NOTHING TO SNEEZE AT

Researchers at the Southern Plains Agricultural Research Center use pollen analyses to determine insect pest dispersal, food sources, and origins. Pollen analysis identified that boll weevil re-infestations in the Southern Rolling Plains eradication zone of Texas likely originated from the Winter Garden region of Texas. For additional information contact Dr. Gretchen Jones (gretchen.jones@ars.usda.gov).





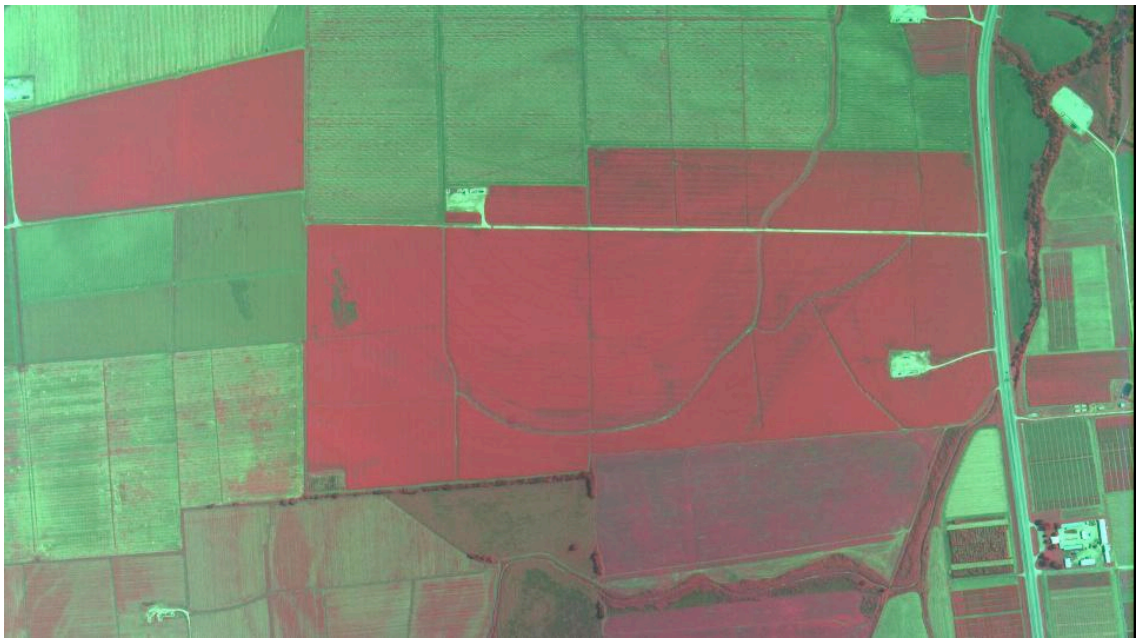


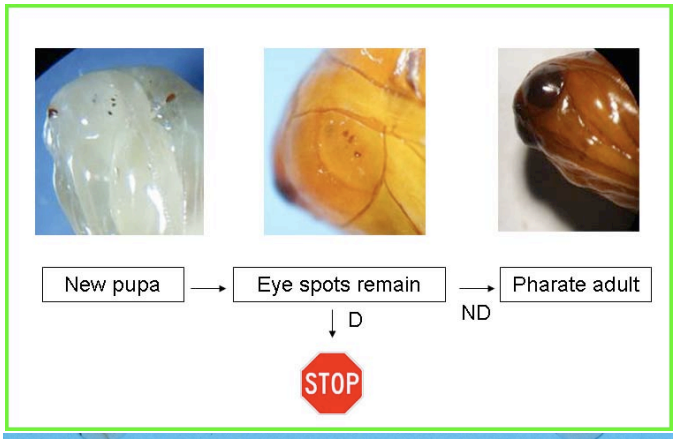
MAXIMUM EFFICACY OF AERIALLY-APPLIED BIOLOGICALS

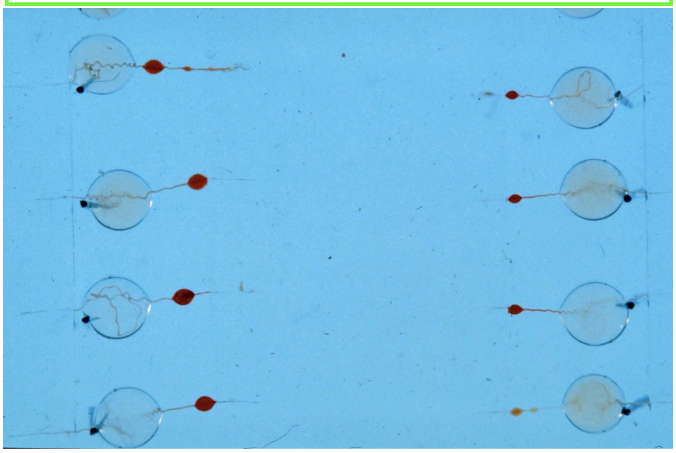
Researchers at the Southern Plains Agricultural Research Center identify optimum deposition of aerially-applied biologicals on plants to maximize efficacy for crop production and protection. For additional information contact Dr. Juan D. López (juan.lopez@ars.usda.gov).

AIRBORNE REMOTE SENSING SYSTEM

Researchers at the Southern Plains Agricultural Research Center develop and evaluate airborne remote sensing systems. The systems and techniques will increase the speed of image acquisition and enhance the use of aerially-acquired images for precision application in pest management. For additional information contact Dr. Yubin Lan (yubin.lan@ars.usda.gov).

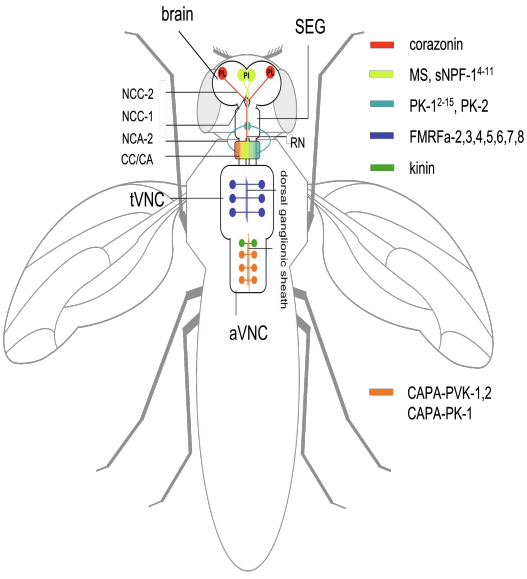


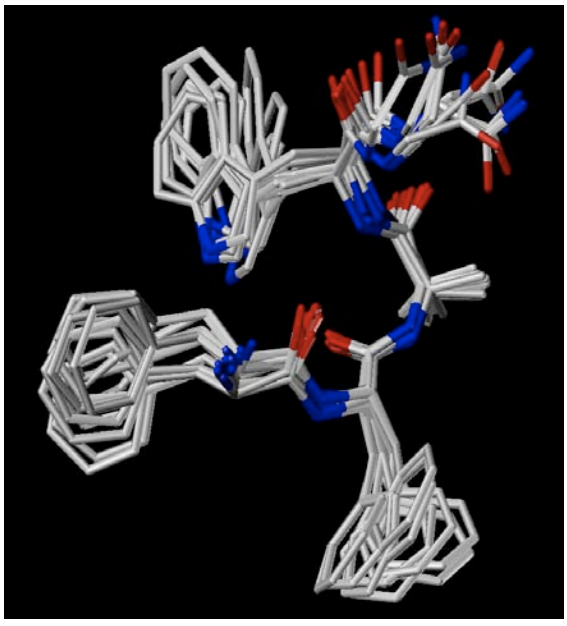


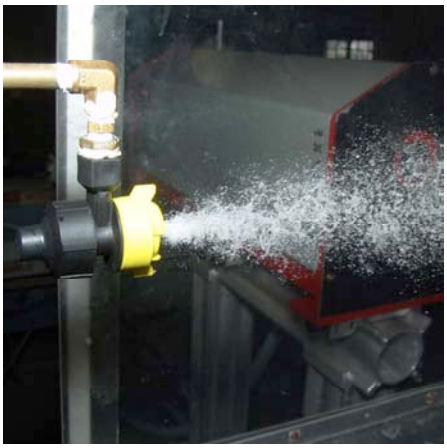


DEVELOPMENT OF NOVEL INSECT NEUROPEPTIDE-BASED PEST CONTROL

Researchers at the Southern Plains Agricultural Research Center are developing novel, safe pest control agents that disrupt neuropeptide regulation of critical insect-specific life processes. For additional information contact Dr. Ron Nachman (ron.nachman@ars.usda.gov).

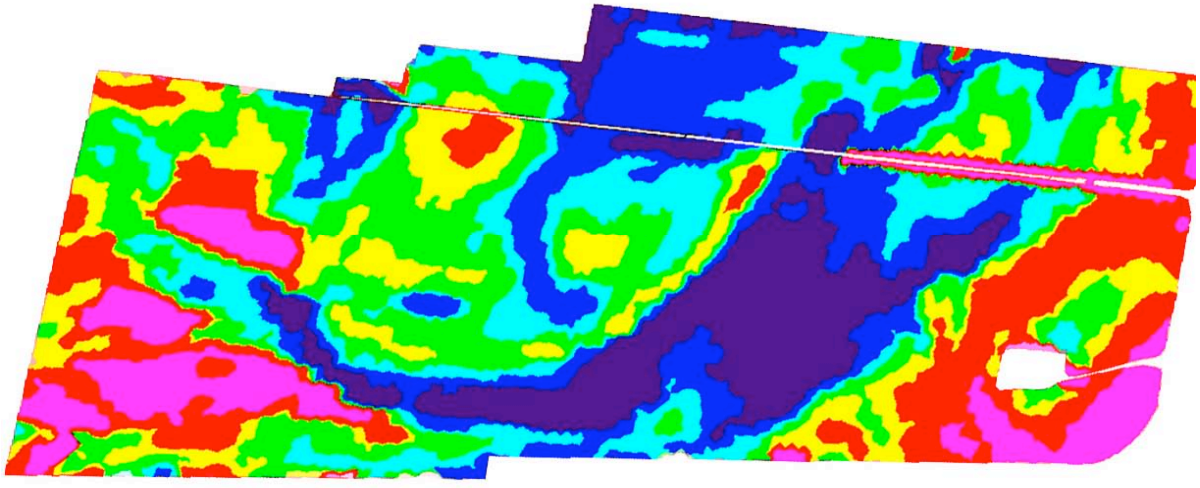






VARIABLE-RATE AERIAL APPLICATION

Researchers at the Southern Plains Agricultural Research Center evaluate the performance of emerging nozzle technologies for incorporation into variable-rate aerial application systems. This research seeks to provide a rapid method of applying crop protectants just where needed within a field. For additional information contact Dr. Dan Martin (dan.martin@ars.usda.gov).

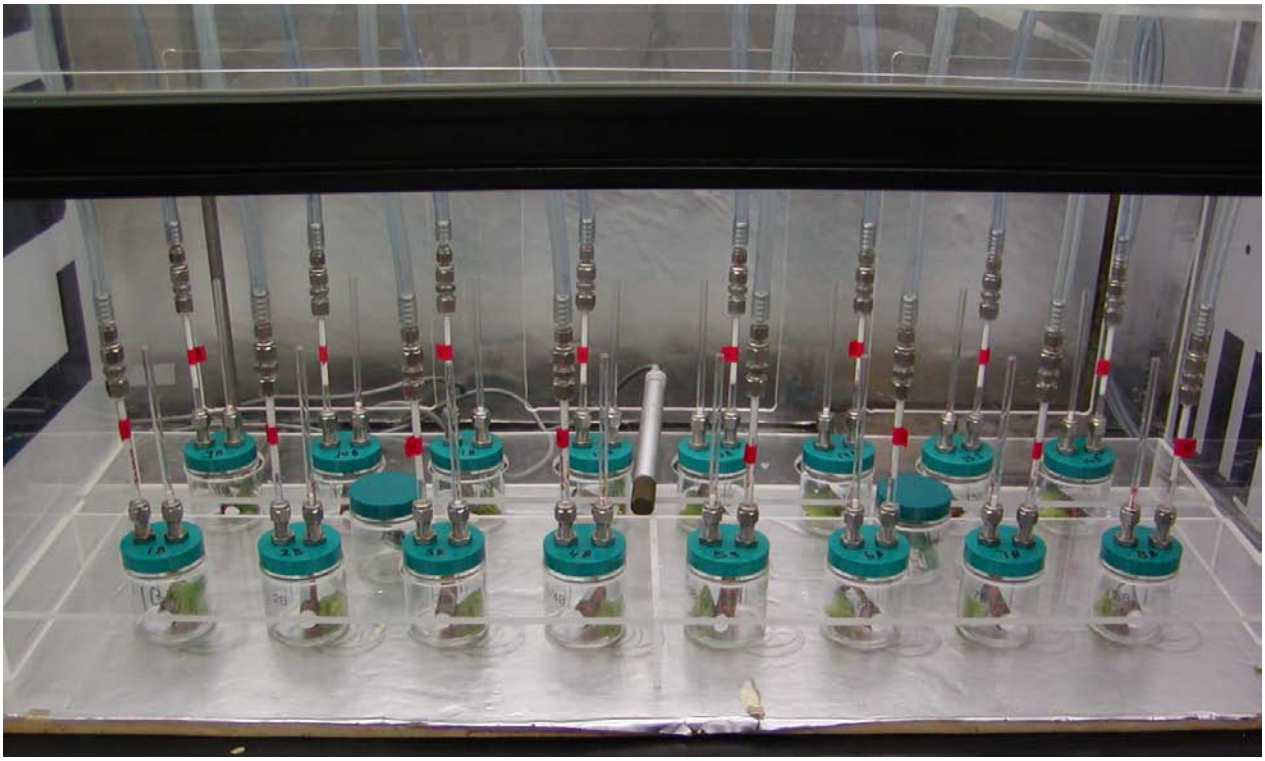


ATMOSPHERIC IMPACTS ON CROP PEST INSECT POPULATIONS

Researchers at the Southern Plains Agricultural Research Center conduct field and controlled-atmosphere research that measures atmospheric factors used to estimate dispersal and overwintering emergence of pest insects in crops and uncultivated habitats. The research has shown that pest insect emergence from overwintering habitats increases following warm rain events. For additional information contact Dr. John Westbrook (john.westbrook@ars.usda.gov).

BOLL WEEVIL PHEROMONE PRODUCTION

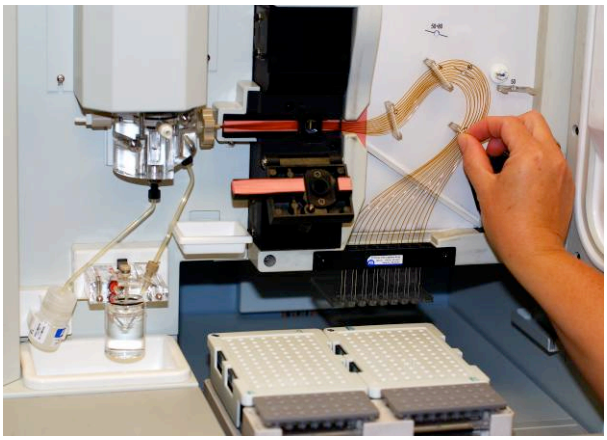
Researchers at the Southern Plains Agricultural Research Center are examining the chemical ecology of boll weevils to improve pheromone trapping methods. For additional information contact Dr. Charles Suh (charles.suh@ars.usda.gov).



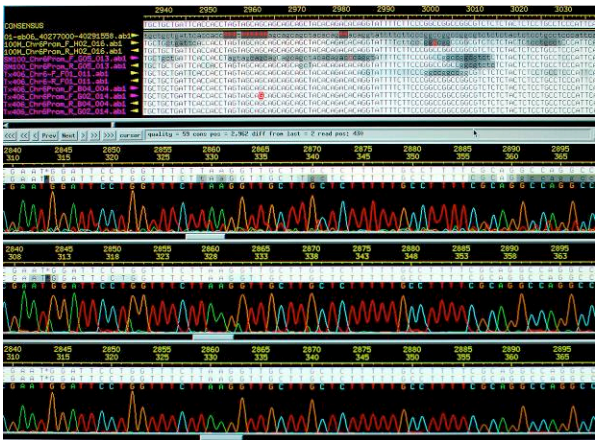
GRASS GENETICS AND BREEDING RESEARCH

Researchers at the Southern Plains Agricultural Research Center conduct fundamental genetic and cytogenetic studies of warm-season grasses to develop improved germplasm and grass cultivars that are used for forages and biofuels. Much of this research addresses apomixis (seed development without fertilization), species relationships, barriers to wide hybridization, and sterility issues. For additional information contact Dr. Byron Burson (byron.burson@ars.usda.gov)

EXPLOITING UNTAPPED PERFORMANCE IN SORGHUM GERMPLASM COLLECTIONS

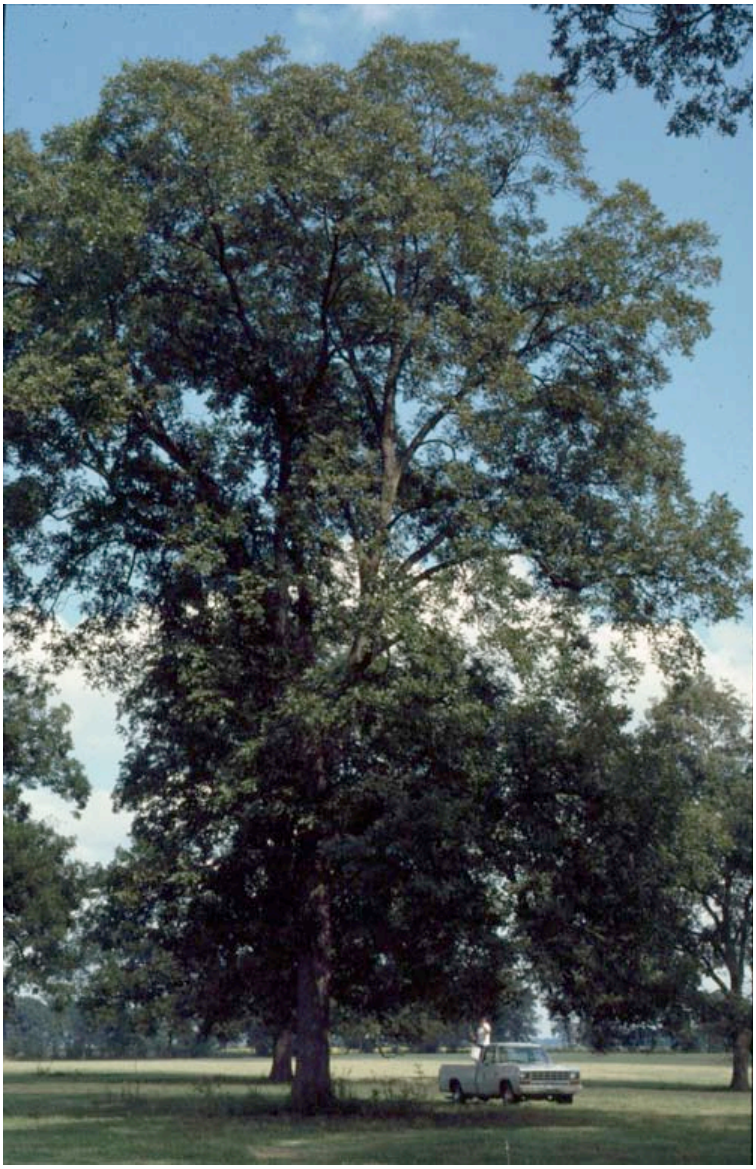


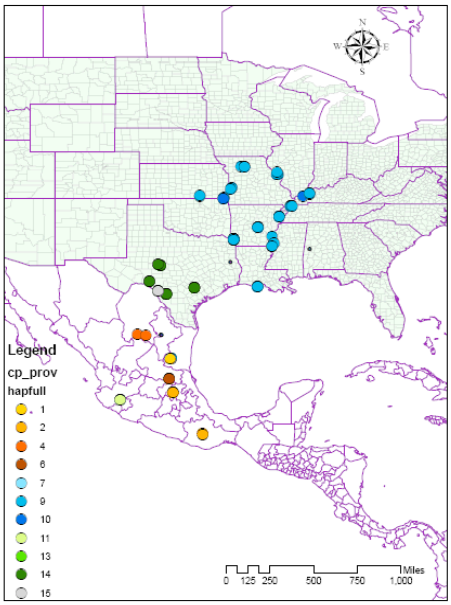
Researchers at the Southern Plains Agricultural Research Center are utilizing genomic and genetic resources to facilitate gene discovery and to increase the utilization of the USDA-ARS sorghum germplasm collection. Genes that are critical for hybrid seed production have been cloned, while genes that will permit the conversion of valuable tropical sorghum to adapted-temperate germplasm have been pinpointed on the sorghum genome. For additional information contact Dr. Bob Klein (bob.klein@ars.usda.gov).



THE NATIONAL COTTON GERMPLASM COLLECTION

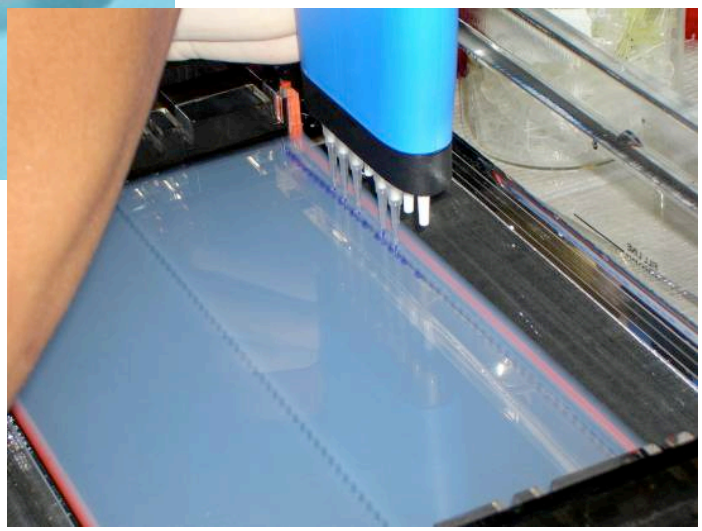
Researchers at the Southern Plains Agricultural Research Center acquire, conserve, and characterize critical cotton germplasm; and distribute it to other researchers and breeders worldwide to support ongoing efforts aimed at improving the crop. For additional information contact Dr. James Frelichowski (james.frelichowski@ars.usda.gov).





COLLECTING, MAINTAINING, CHARACTERIZING, CONSERVING AND DISTRIBUTING THE GENETIC DIVERSITY OF THE CARYA GENUS

Researchers at the Southern Plains Agricultural Research Center maintain the ARS National Collection of Genetic Resources for Pecans and Hickories. World-wide species of the genus Carya, range-wide populations of pecan, and the historic cultivars of the pecan industry are being maintained as living collections for both preservation and use by researchers and breeders. For additional information contact Dr. L. J. Grauke (lj.grauke@ars.usda.gov).



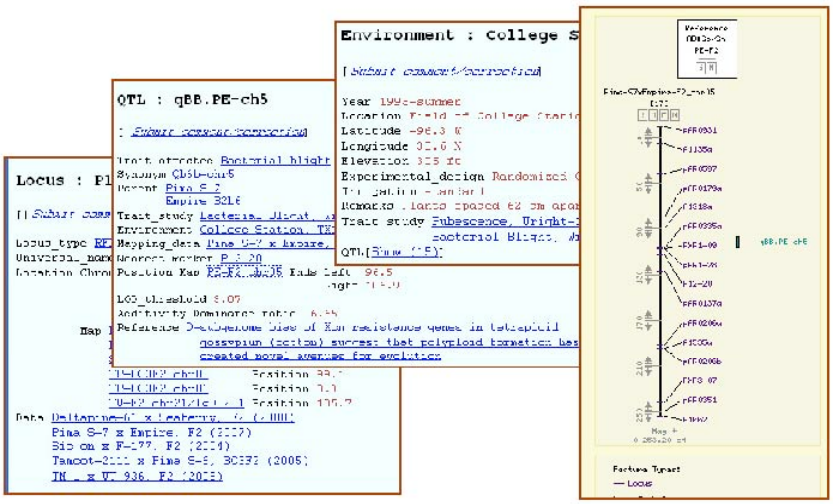
COTTON GERMPLASM CHARACTERIZATION

Researchers at the Southern Plains Agricultural Research Center are evaluating the genetic diversity of accessions in the U.S. Cotton Germplasm Collection. Information obtained will be used by the cotton research community, and by breeders, to develop better cotton varieties for U.S. farmers. For additional information contact Dr. Lori Hinze (lori.hinze@ars.usda.gov).

COTTON GENETIC RESOURCES DATABASE

Researchers at the Southern Plains Agricultural Research Center maintain CottonDB (http://cottondb.org), a database that serves the cotton research community as both an archival and dynamic resource for genomic, genetic, and taxonomic information on the genus Gossypium. The database contains information on genomic markers, nucleotide sequences, genes, alleles, genetic maps, taxonomic and descriptor data of germplasm, and relevant bibliographic citations. For additional information contact Dr. Richard Percy (richard.percy@ars.usda.gov).

QTL Data Queries



SORGHUM FUNGAL DISEASE RESISTANCE

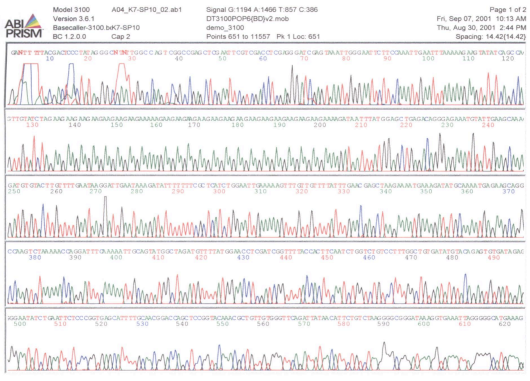
Researchers at the Southern Plains Agricultural Research Center are evaluating sorghum germplasm for new sources of disease resistance against fungal pathogens that cause anthracnose, grain mold, head smut, and downy mildew. Germplasm has been identified that has resistance to each of these diseases which provides breeders with new resources for sorghum improvement. For additional information contact Dr. Louis Prom (louis.prom@ars.usda.gov).

IMPROVED PECAN CULTIVARS FOR GROWERS AND CONSUMERS

Researchers at the Southern Plains Agricultural Research Center conduct the ARS Pecan Breeding and Genetics Program which produces new high-yielding cultivars with disease and insect resistance and outstanding nut quality. To date, the program has developed and released 28 improved cultivars (all with Native American names). Pawnee (released in 1983) is the most popular pecan cultivar in the world. For additional information contact Dr. Tommy Thompson (tommy.thompson@ars.usda.gov).

INTEGRATED GNEOME MAPPING FOR COTTON IMPROVEMENT

Researchers at the Southern Plains Agricultural Research Center develop cotton genome maps that integrate genetic, physical, and transcript information. DNA markers and clones located on the maps are used to characterize the germplasm collections and to identify major genes and quantitative trait loci (QTLs) for genetic improvement of the cotton crop. For additional information contact Dr. John Yu (john.yu@ars.usda.gov).



FUSARIUM - A NEW THREAT TO U.S. COTTON PRODUCTION

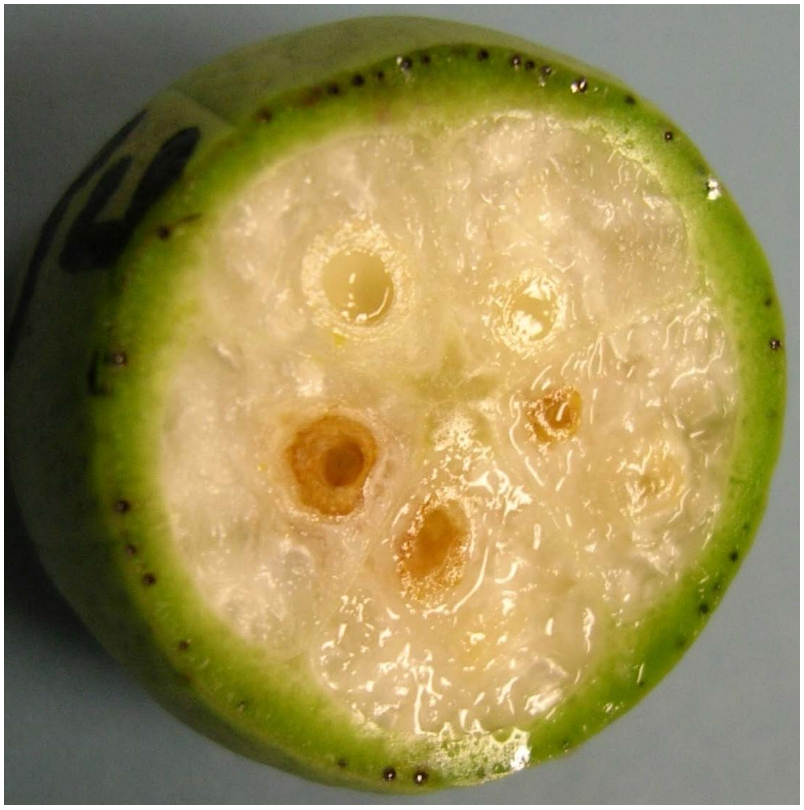
Researchers at the Southern Plains Agricultural Research Center are intensively studying an Australian strain of the Fusarium oxysporum fungus, recently introduced accidently into the U.S.; it poses major risk to about half of U.S. cotton production. Disrupting the action of certain genes in the fungus makes it less pathogenic, and offers clues on development of methods to effectively manage the disease. For additional information contact Dr. Jinggao Liu (jinggao.liu@ars.usda.gov).

Above: Tomato seedlings growing in a Petri dish in agar infested with the wild Australian biotype of F.o.v.

Right: Tomato seedlings growing in a Petri dish in agar infested with the mutant, less pathogenic Australian biotype of F.o.v.

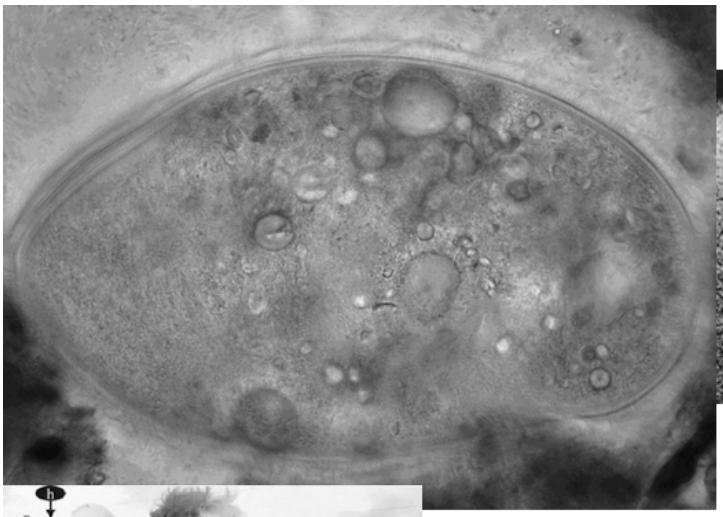
RENIFORM NEMATODE-RESISTANT COTTON

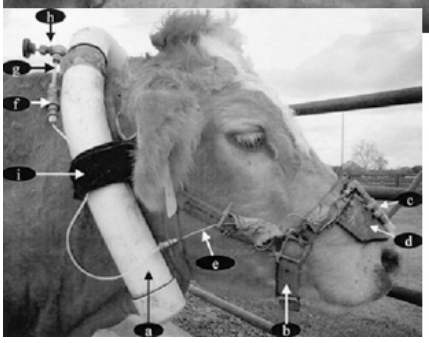
Researchers at the Southern Plains Agricultural Research Center are working to introduce immunity to the reniform nematode from a wild cotton species into Upland cotton. New lines recently developed are largely nematode resistant, and also show improvement in fiber qualities. For additional information contact Dr. Al Bell (al.bell@ars.usda.gov).



COTTONSEED ROT

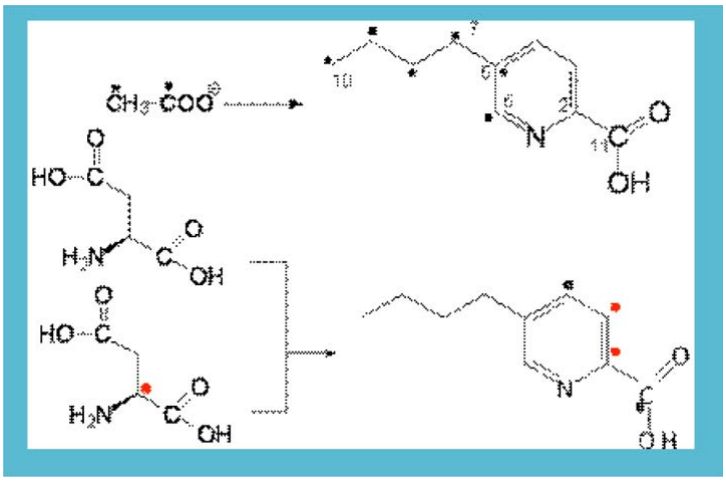
Researchers at the Southern Plains Agricultural Research Center are establishing the cause of South Carolina seed rot, a cotton disease that can cause major losses to some farmers. Certain bacteria, transmitted by the southern green stink bug, have been shown to induce seed rot, and methods to successfully prevent damage are being developed. For additional information contact Dr. Gino Medrano (gino.medrano@ars.usda.gov).





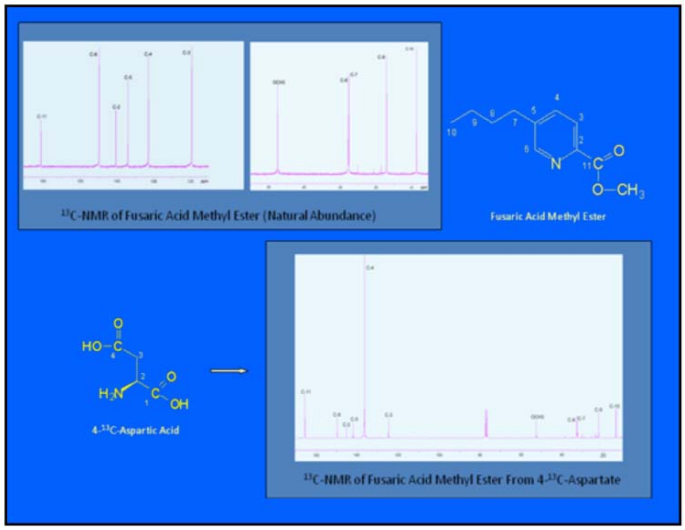
REDUCING METHANE GENERATION BY RUMINANTS

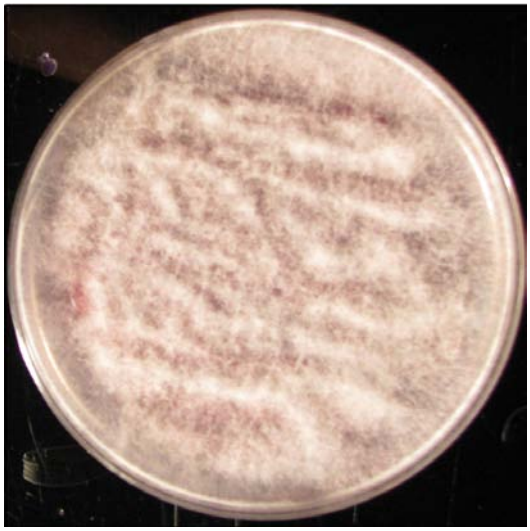
Researchers at the Southern Plains Agricultural Research Center are working on strategies to reduce foodborne pathogens such as Salmonella and Campylobacter in the digestive tract of cattle, while simultaneously reducing methane production by the animals. Methane generation by ruminants constitutes nearly 20% of the annual U.S. emissions of this potent greenhouse gas into the atmosphere. For additional information contact Dr. Robin Anderson (robin.anderson@ars.usda.gov).



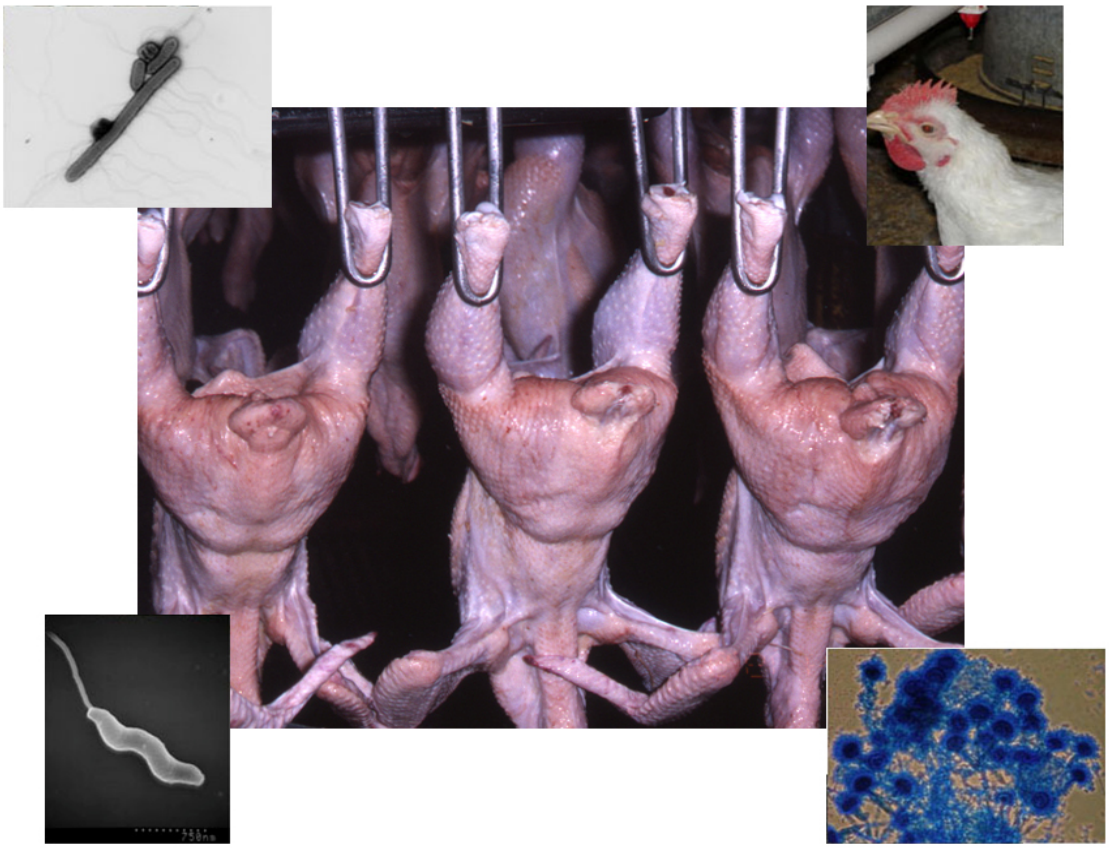
BIOSYNTHESIS OF THE PLANT TOXIN FUSARIC ACID

Researchers at the Southern Plains Agricultural Research Center are seeking ways to control a particularly virulent fungal pathogen of cotton that has the potential of devastating much of the U.S. cotton crop. The fungus produces high levels of toxic fusaric acid; work on how this chemical is biosynthesized will guide genetic research to develop effective control methods. For additional information contact Dr. Bob Stipanovic (bob.stipanovic@ars.usda.gov).

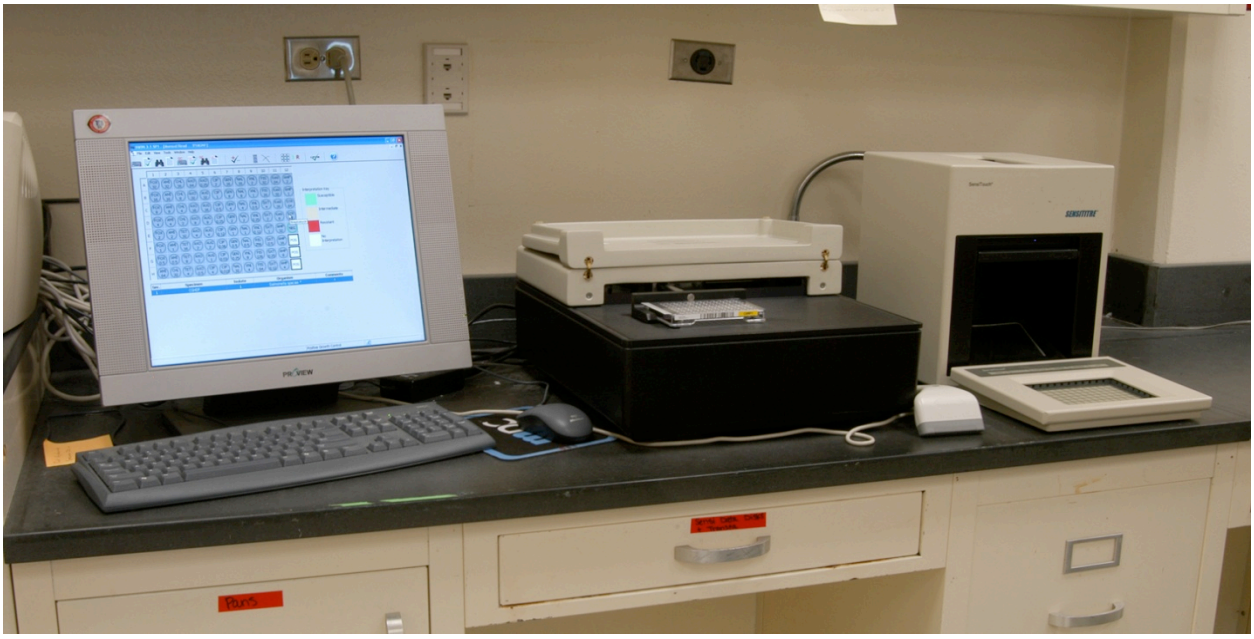




BETTER POULTRY MANAGEMENT TO CONTROL HARMFUL BACTERIA

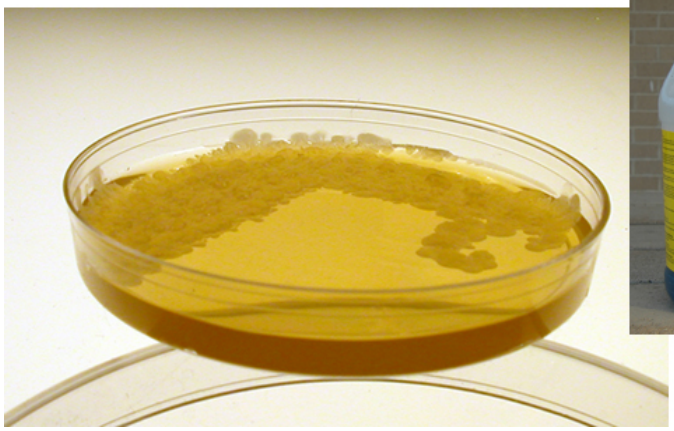


Researchers at the Southern Plains Agricultural Research Center are evaluating different poultry production practices to determine those that are most effective in reducing the occurrence of food poisoning microorganisms in and on the birds. For additional information contact Dr. Allen Byrd (allen.byrd@ars.usda.gov).



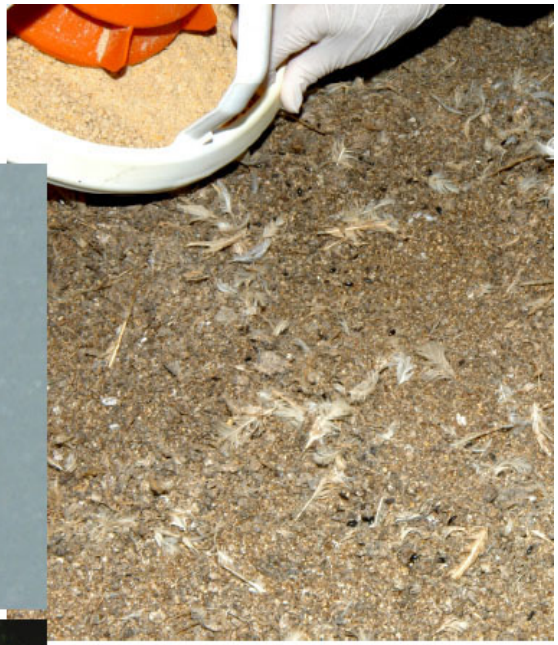
CONTROL OF HARMFUL BACTERIA WITH ANTIBIOTICS/ DISINFECTANTS

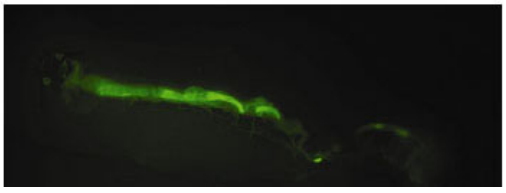
Researchers at the Southern Plains Agricultural Research Center are developing methods to use antibiotics coupled with disinfectants to better control pathogenic and food-poisoning bacteria in farm animals and in the environments in which they are reared. For additional information contact Dr. Ross Beier (ross.beier@ars.usda.gov).

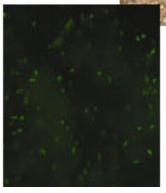


POULTRY HOUSE INSECTS IMPACT FOOD SAFETY

Researchers at the Southern Plains Agricultural Research Center are evaluating insects (such as the lesser mealworm) that are common pests in poultry houses and which can transfer harmful bacteria such as Salmonella to the birds which then become a food safety problem for the consumer. For additional information contact Dr. Tawni Crippen (tc.crippen@ars.usda.gov).





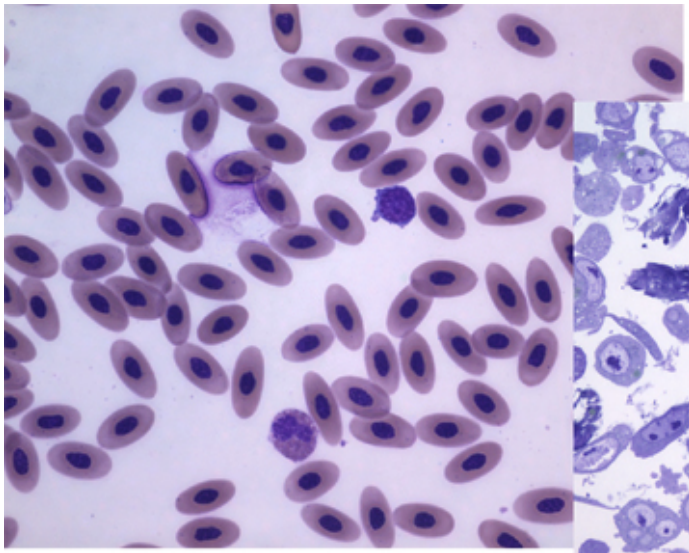


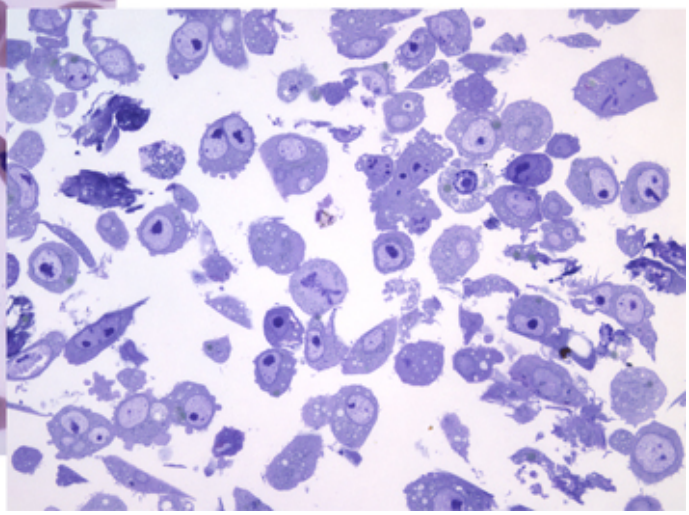
CONTROL OF BACTERIA BY DIET MANIPULATION

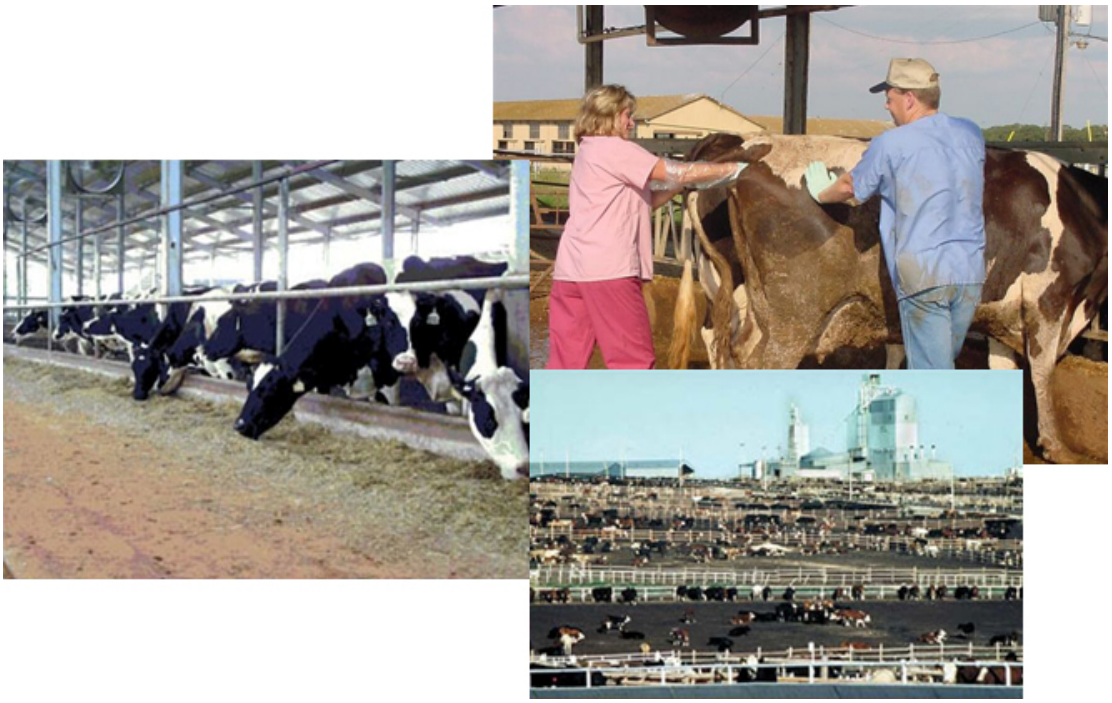
Researchers at the Southern Plains Agricultural Research Center are evaluating different animal diets, and dietary supplements, to identify better methods to reduce the colonization of food producing animals by harmful bacteria such as Salmonella and E. coli. For additional information contact Dr. Todd Callaway (todd.callaway@ars.usda.gov).

STIMULATING THE IMMUNE SYSTEM TO PROTECT LIVESTOCK

Researchers at the Southern Plains Agricultural Research Center are developing methods to stimulate the immune systems of farm animals so that the animals can better resist infection by microbial pathogens that can cause disease, and that are of human food safety significance. For additional information contact Dr. Ken Genovese (kenneth.genovese@ars.usda.gov).

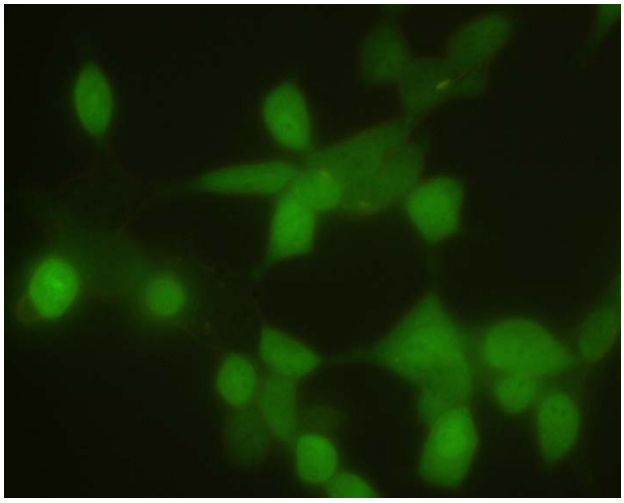






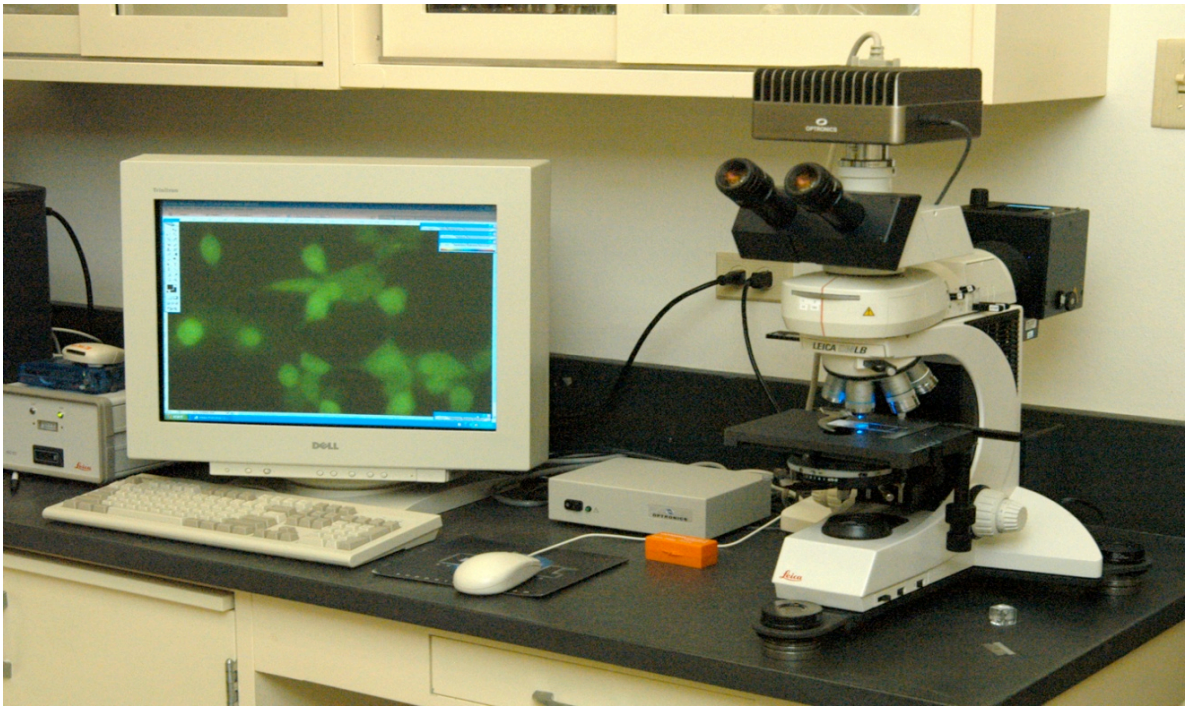
MANAGEMENT PRACTICES TO REDUCE PATHOGENS IN LIVESTOCK PRODUCTION

Researchers at the Southern Plains Agricultural Research Center are evaluating modern practices for both dairy and beef cattle production to develop new strategies that will reduce pathogens such as Salmonella and E. coli in breeding animals, and also those intended for slaughter. For additional information contact Dr. Tom Edrington (tom.edrington@ars.usda.gov).



IMMUNE SYSTEM STIMULANTS TO PROTECT COMMERCIAL POULTRY

Researchers at the Southern Plains Agricultural Research Center are studying the innate immune system in poultry to identify immune stimulators that will increase resistance in the birds to infection by harmful bacteria, and that can also be used as effective adjuvants for vaccines to immunize birds against these disease organisms. For additional information contact Dr. Haiqi He (haiqi.he@ars.usda.gov).

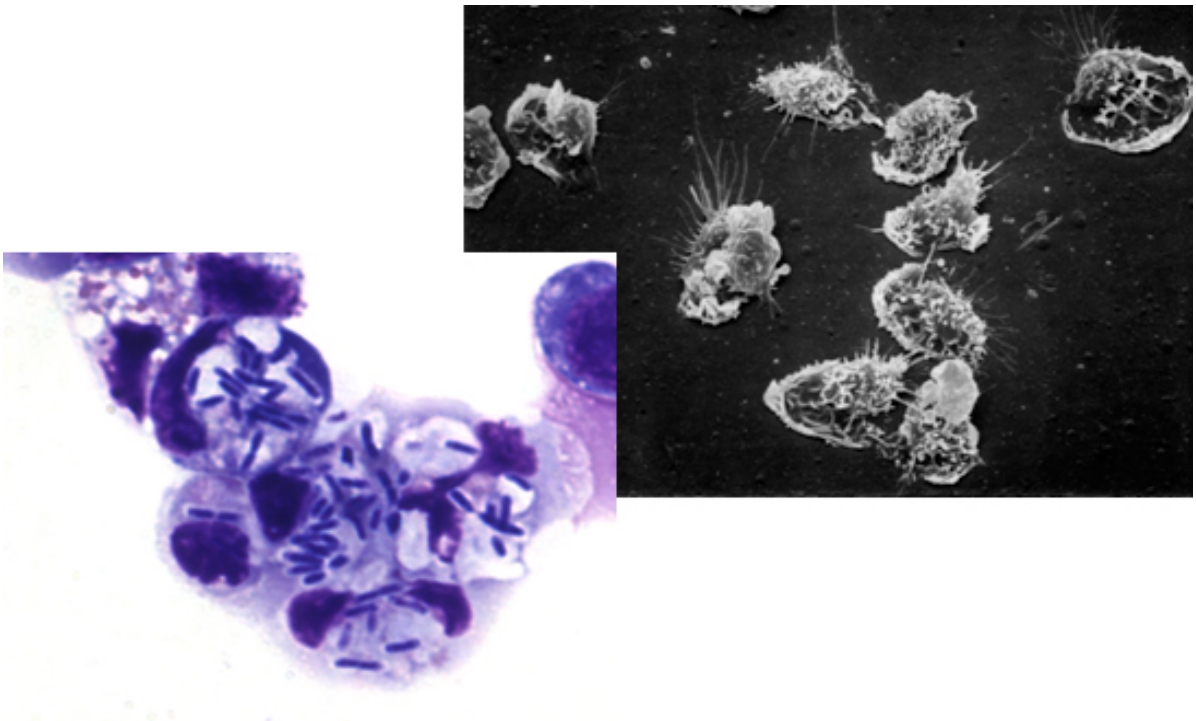


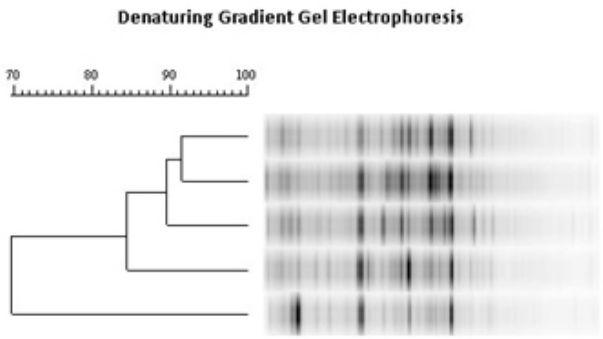
TRANSFER OF PATHOGENIC BACTERIA BETWEEN PIGS AND HUMANS

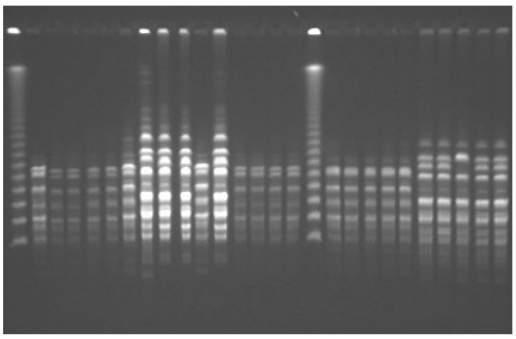
Researchers at the Southern Plains Agricultural Research Center are studying the dynamics of the disease bacterium, Clostridium difficile, to determine if it can be transferred between commercially-produced swine and humans. For additional information contact Dr. Roger Harvey (roger.harvey@ars.usda.gov).

FUNDAMENTAL KNOWLEDGE OF THE AVIAN IMMUNE SYSTEM

Researchers at the Southern Plains Agricultural Research Center are conducting fundamental research on the immune system of poultry to facilitate development of non-antibiotic, immunologically-based strategies to increase resistance to *Salmonella* and *Campylobacter* in commercially-reared birds. For additional information contact Dr. Mike Kogut (mike.kogut@ars.usda.gov).



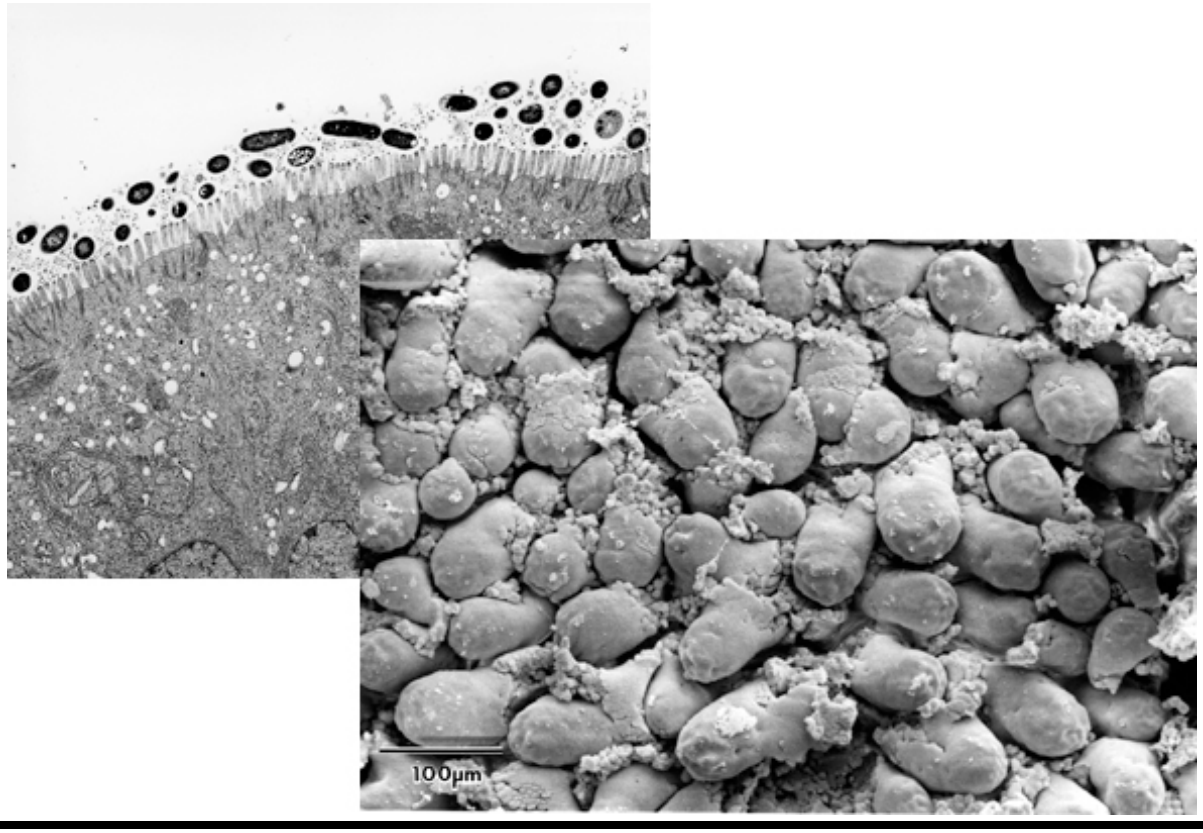


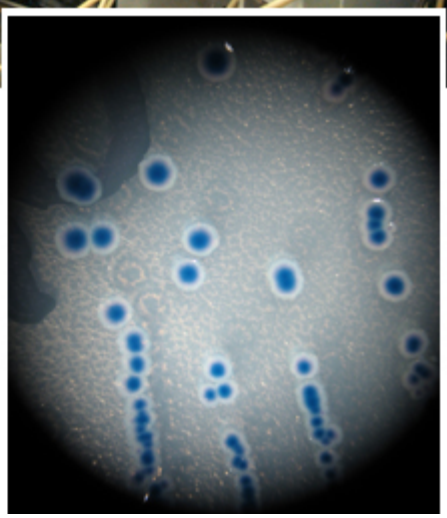


Pulsed-field Gel Electrophoresis

USING GOOD MICROORGANISMS TO CONTROL BAD ONES IN FOOD ANIMALS

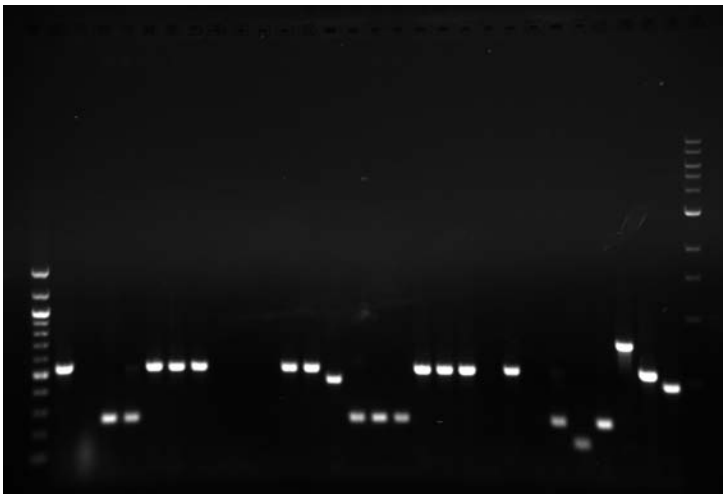
Researchers at the Southern Plains Agricultural Research Center are exploiting harmless microorganisms that occur normally in the gut of poultry, cattle, and swine to develop new methods to prevent animal infection by harmful bacteria such as *Campylobacter* and *E. coli*. For additional information contact Dr. Michael Hume (michael.hume@ars.usda.gov)

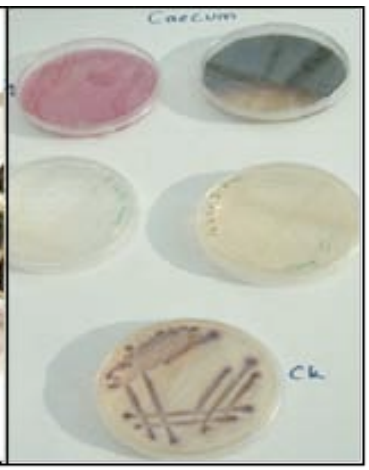




CONTROL OF ANTIBIOTIC-RESISTANT PATHOGENS

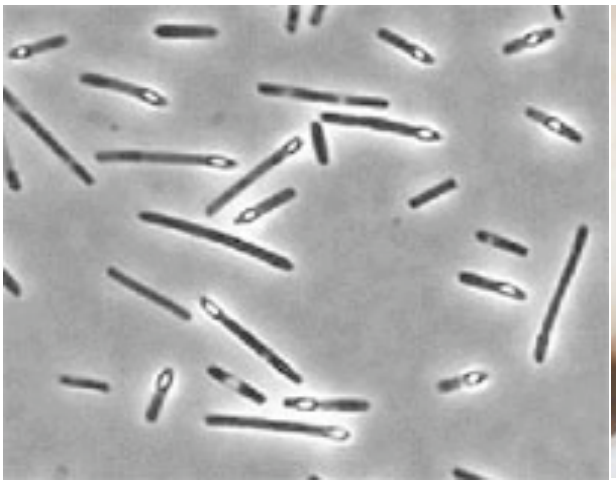
Researchers at the Southern Plains Agricultural Research Center are assessing bacteria such as *E. coli* for development of resistance to antibiotics, so that procedures can be developed to minimize the harmful effects of these pathogenic and food poisoning microorganisms. For additional information contact Dr. Toni Poole (toni.poole@ars.usda.gov).

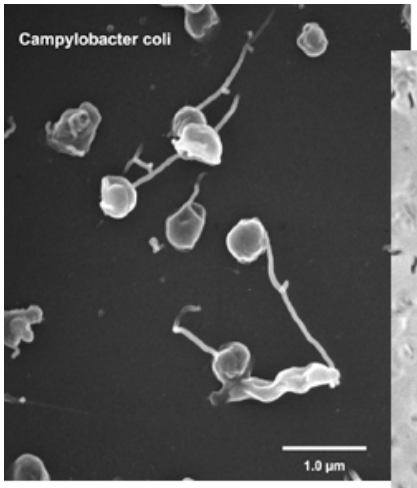


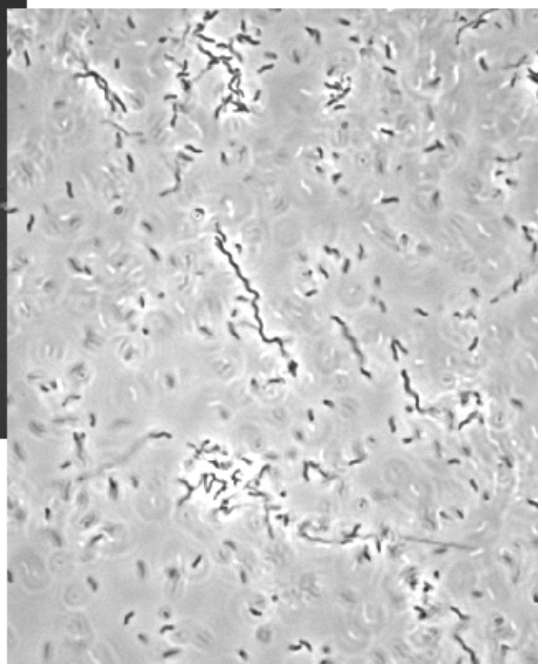


NON-ANTIBIOTIC CONTROL OF NECROTIC ENTERITIS

Researchers at the Southern Plains Agricultural Research Center are working on development of non-antibiotic intervention strategies to minimize the adverse effects of *Clostridium*-caused disease (necrotic enteritis) in poultry, and also to minimize the potential food safety implications of this bacterium. For additional information contact Dr. Jack McReynolds (jackson.mcreynolds@ars.usda.gov).

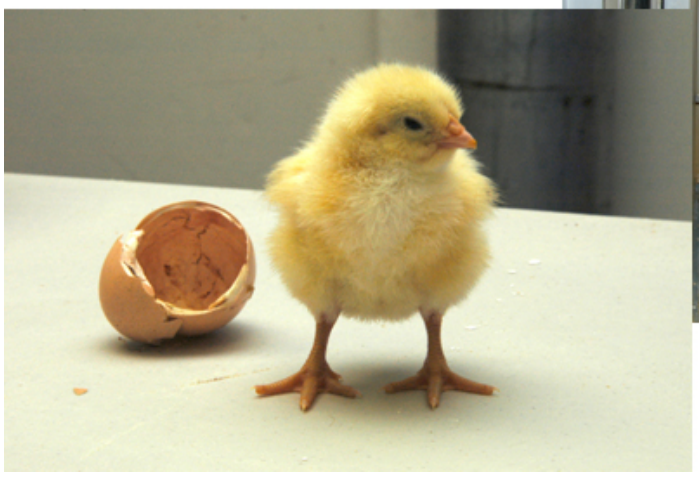






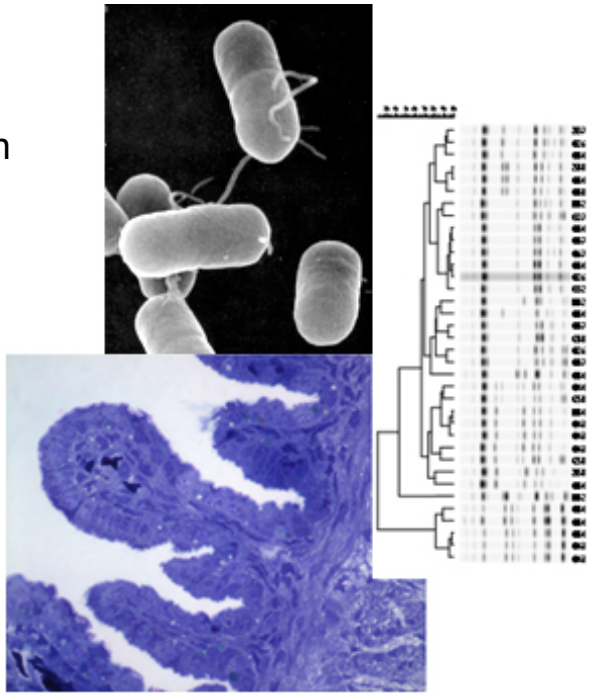
BREEDING PATHOGEN-RESISTANT POULTRY

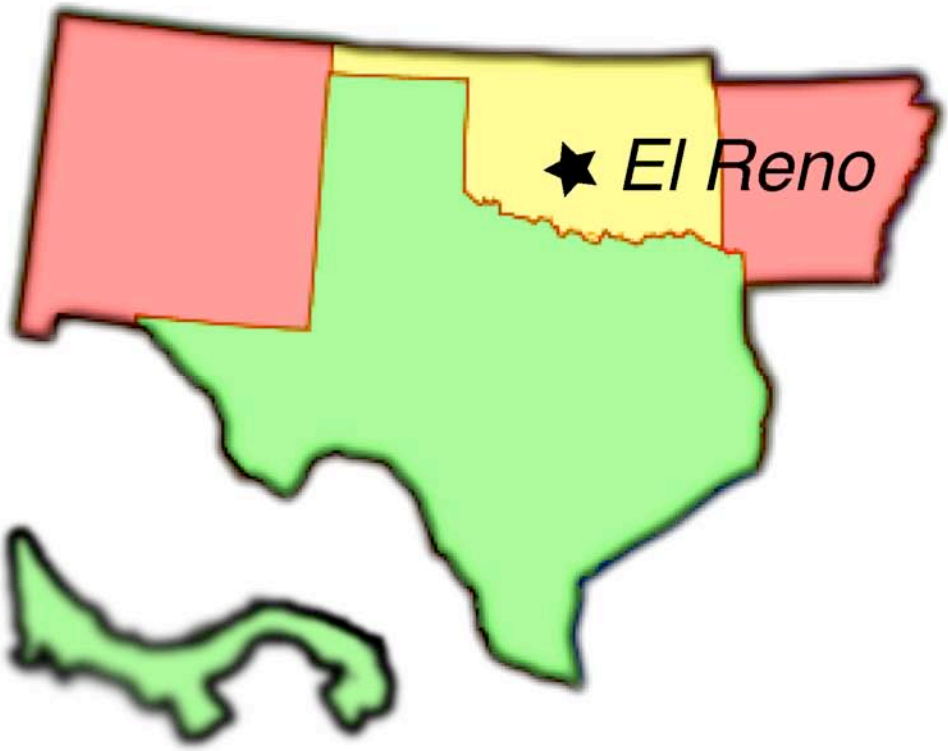
Researchers at the Southern Plains Agricultural Research Center are using genetic selection procedures to develop new lines of chickens that are naturally resistant to infection/colonization by pathogenic and food poisoning bacteria such as *Salmonella* and *Campylobacter*. For additional information contact Dr. Christi Swaggerty (christi.swaggerty@ars.usda.gov).



MICROBIAL ECOLOGY OF THE POULTRY HOUSE ENVIRONMENT

Researchers at the Southern Plains Agricultural Research Center are studying the microbial ecology within the digestive tract of poultry with the goal of developing management practices that will decrease the incidence of pathogenic or food poisoning microorganisms in the poultry rearing environment. For additional information contact Dr. Cynthia Sheffield (cindy.sheffield@ars.usda.gov).



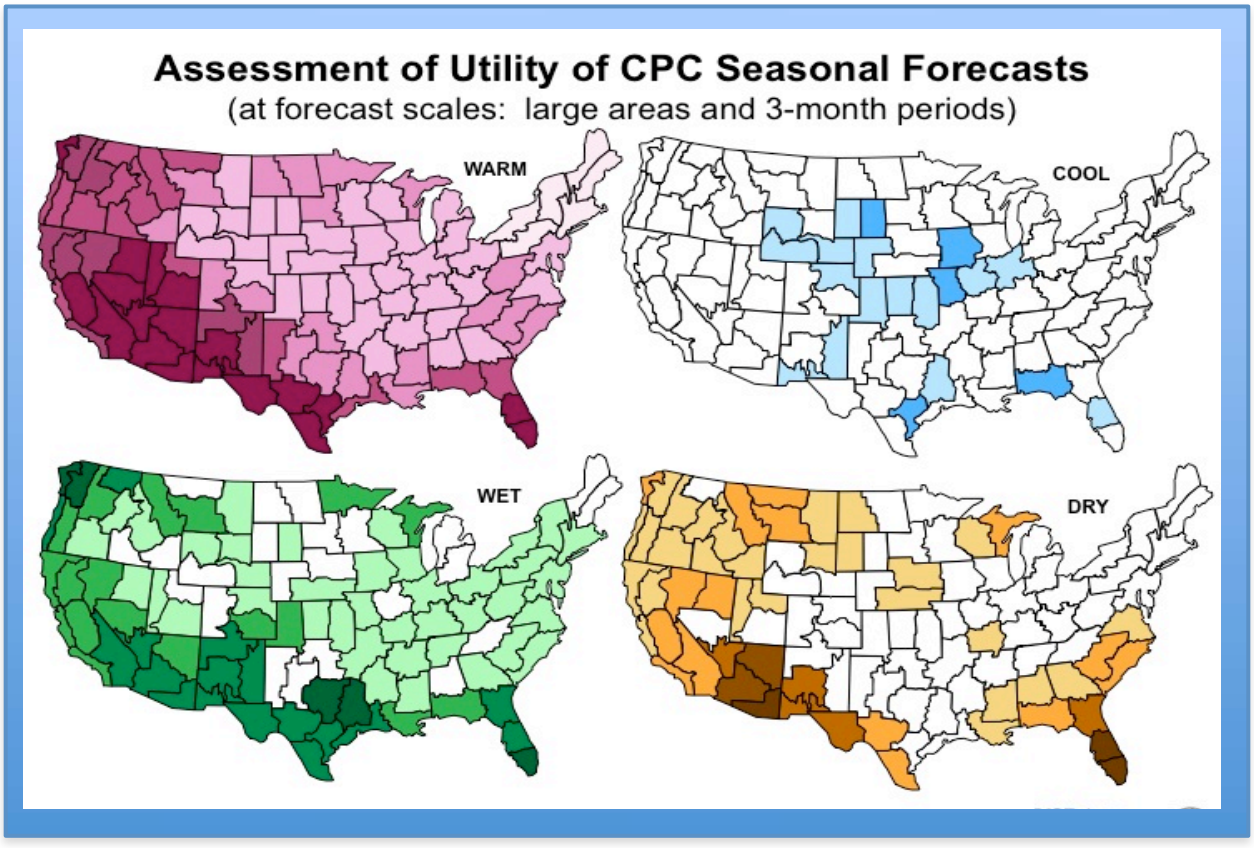

El Reno

REAL-TIME ASSESSMENT OF FORAGE QUALITY

Laboratory methods used to determine diet quality of free-ranging animals may be costly, may generate undesired chemical wastes, or may provide results back to the producer too late to be of practical use. We are developing remote sensing based technology to overcome these obstacles to provide real-time estimates of forage quality. Contact Patrick Starks (patrick.starks@ars.usda.gov) for additional information.

SEASONAL CLIMATE FORECASTS: READY FOR USE?

Current climate forecasts have some shortcomings when it comes to practical applications. Scientists at the Grazinglands Research Laboratory determined that forecast utility depends on what is being forecast (average temperature versus precipitation), where in the continental U.S., and whether or not an ENSO event is occurring (strong ENSO events have more predictable impacts). The maps below highlight regions with better overall potential utility - darker colors indicate more frequent, skillful predictions. For regions with good utility, a method has been developed to use the forecasts with crop or hydrologic models in order to predict impacts. Research continues to develop useful climate guidance for the remainder of the U.S., and for non-ENSO conditions. Contact Jeanne Schneider (jeanne.schneider@ars.usda.gov) for additional information.

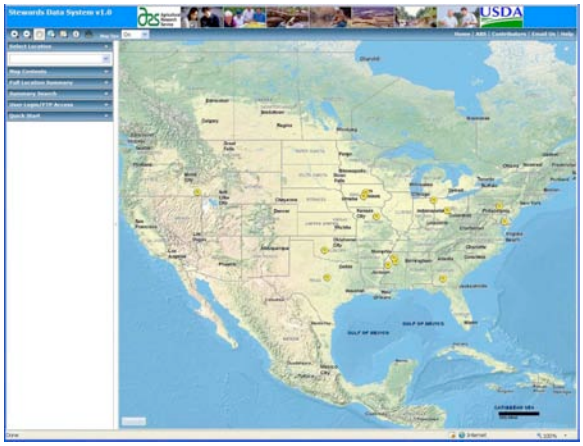


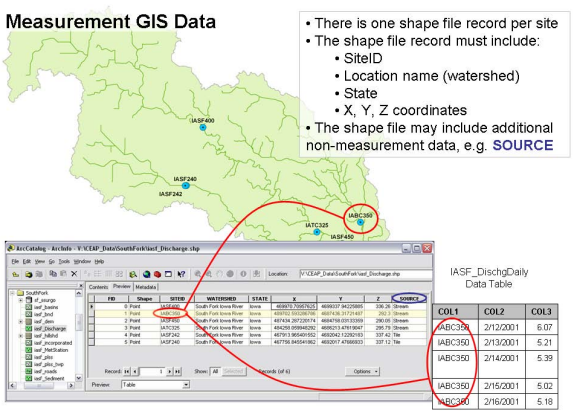
RESERVOIR SEDIMENTS TELL WATERSHEDS' HISTORY

Scientists at the Grazinglands Research Laboratory select water-retarding reservoirs impacted by contrasting land use and conservation practices, develop bathymetric to determine long-term sediment delivery rates using the rapid "state-of-the-art" acoustic profiling system and compile land use and conservation practices over time for each sub-basin contributing to the selected reservoirs. Our aim is to quantify the impacts of contrasting land use and conservation in agricultural watersheds on sediment delivery to watershed outlets using the measured delivery rates and the SWAT model. Also the impact of climate change on the delivery rates of sediment into reservoir will be assessed. Contact Dr. Jean L. Steiner (jean.steiner@ars.usda.gov) for additional information.

NATIONAL WATERSHED DATA SYSTEM DEVELOPED

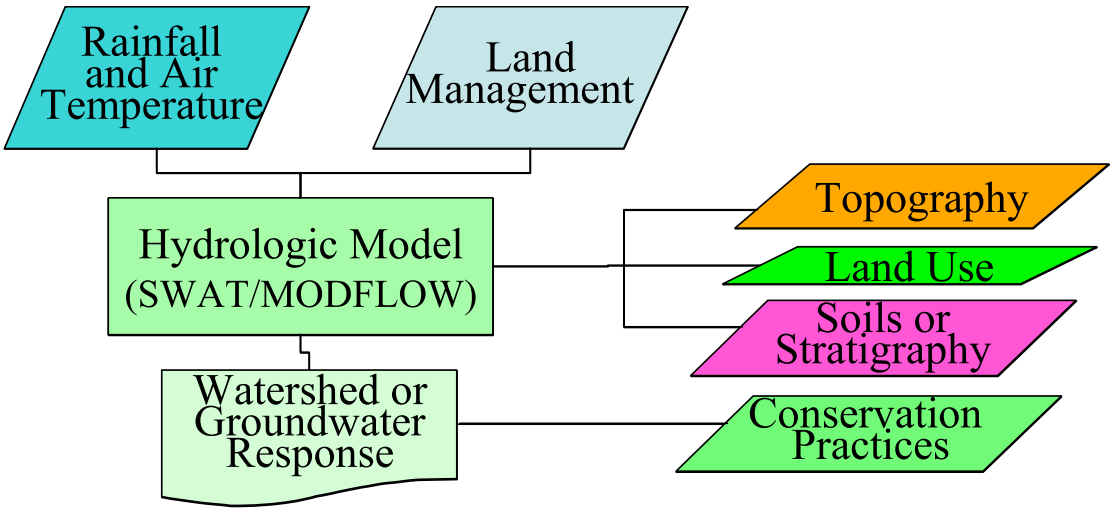
As part of USDA's Conservation Effects Assessment Project, a team from El Reno, OK; Columbia, MO; Beltsville, MD; Ames, IA; and Fort Collins, CO, developed a data system: Sustaining the Earth's Watersheds, Agricultural Research Data System (STEWARDS, http://129.186.109.10/stewards.1/). Many ARS watersheds offer decades of data required to address complex issues water resources, climate variability, and global change. Benefits of STEWARDS include efficient data access, transparency, data preservation, and enhanced collaboration within and across watersheds. For more information, contact Dr. Jean L. Steiner (jean.steiner@ars.usda.gov).





MODELING MPACTS OF CONSERVATION WITHIN WATERSHEDS

Researchers at the Grazinglands Research Laboratory are using watershed-scale hydrologic models and field measurements to quantify the benefits of USDA and other conservation practices on water quantity and water quality. Key accomplishments include: (1) Published widely used model evaluation guidelines, in collaboration with other ARS scientists; (2) Incorporated into SWAT new water table depth and tile drain equations in order to improve the model's capability to simulate tile drain flow for tile-drained regions such as the Midwest U.S in collaboration with scientists from USDA ARS in Temple Texas; (3) In collaboration with scientists from the USDA-ARS in Bushland Texas are planning to link SWAT with MODFLOW, a groundwater model, to aid in understanding the groundwater – surface water interaction processes; (4) Application of SWAT in the CEAP benchmark Fort Cobb River watershed show that higher resolution of precipitation and soil input data can significantly improve model simulation accuracy. Contact Dr. Daniel Moriasi (daniel.moriasi@ars.usda.gov) for additional information.



MULTIYEAR PRECIPITATION VARIATIONS EFFECT WATERSHED RUNOFF AND SEDIMENT YIELD

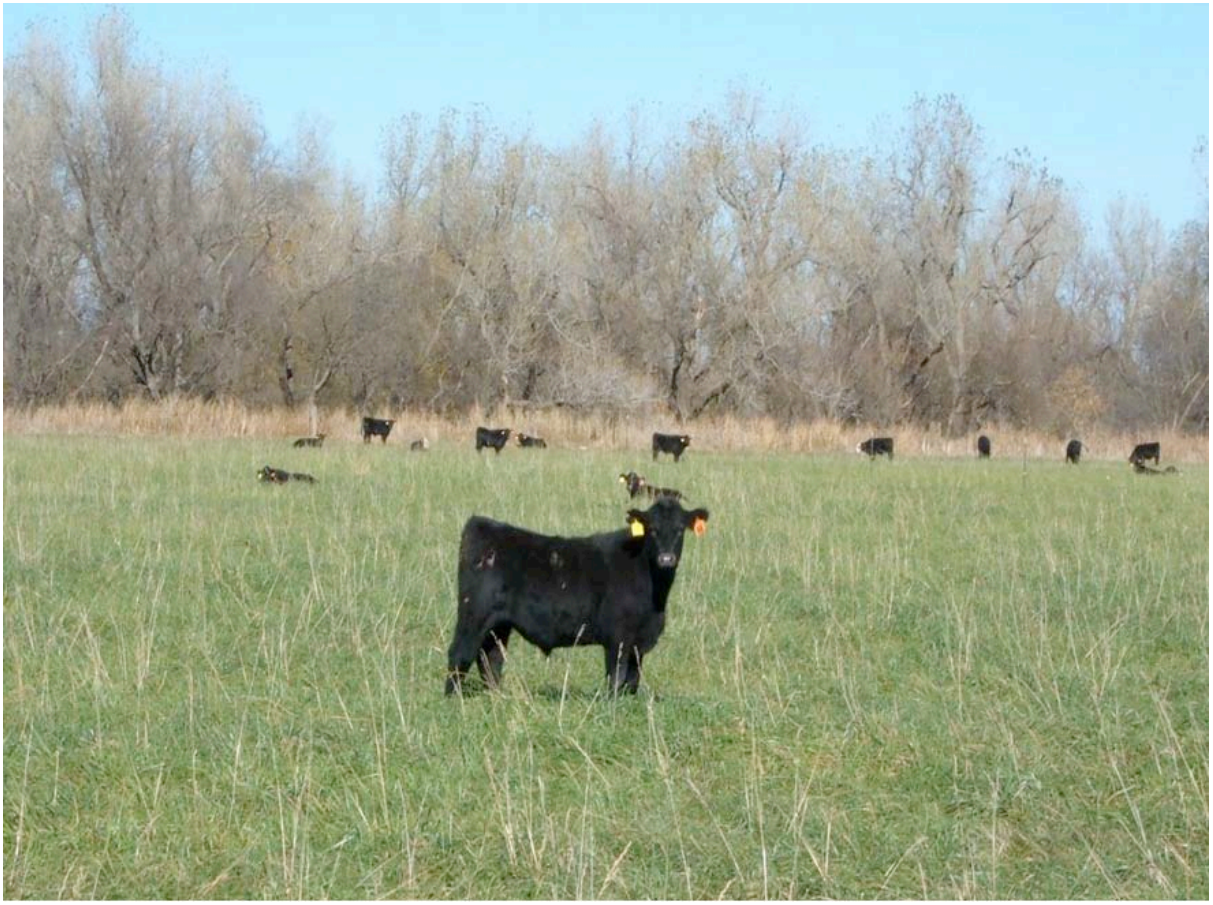
Multiyear precipitation variations in long climatic records are believed to have a considerable impact on watershed runoff, soil erosion, sediment yield, and reservoir sedimentation. A study was conducted on the Fort Cobb reservoir watershed in central Oklahoma to quantify the impact of multiyear wet and dry periods on watershed runoff and sediment yield. Findings showed that wet or dry periods amplified into comparatively larger watershed runoff and sediment yield variations. For the case at hand, a mean annual precipitation difference between wet and dry periods of 30% led to a 100% difference in runoff, which in turn led to a 180% difference in sediment yield. It follows that assessment of effectiveness and benefits of many soil conservation practices is best performed under wet period conditions, as these are conditions for which conservation practices are intended to apply. On the other hand, assessment of long term reservoir sedimentation ought to be based on a representative mix of wet and dry periods, because reservoir sedimentation is the result of a continuous and cumulative process. Contact Jurgen Garbrecht (jurgen.garbrecht@ars.usda.gov) for additional information.

A RARE-EARTH APPROACH TO TRACKING EROSION

Two Agricultural Research Service (ARS) scientists believe that rare-earth elements may be the best tool for tracking--and pinpointing sources of--costly soil erosion. Hydrologist John Zhang and agricultural engineer Mark Nearing of ARS like these compounds because they can be used quickly, accurately and safely to track erosion. Rare-earth elements, which are listed in their own niche of the Periodic Table of the Elements, are actually abundant in Earth's crust. But in soil, they're usually found only in tiny, trace amounts. According to Zhang, the trick to using them to track erosion is to place enough tracer in the soil so that its concentration in collected sediment is about three times its usual concentration. Zhang and Nearing mix them with soil and distribute them with a device similar to a fertilizer spreader. Later, in the lab, they detect the elements in sediment through a spectrometry procedure using a new extraction technique that they developed. Contact Dr. John Zhang (john.zhang@ars.usda.gov) for additional information.

INTEGRATED BEEF CATTLE PRODUCTION SYSTEMS

The preweaning phase of beef production comprises over 30% of the lifespan of a calf, yet little is known about the affect of preweaning factors, such as milk yield of the cow, on postweaning performance of the calf. Research at the Grazinglands Research Laboratory, El Reno, OK, is evaluating the relationships of cow milk yield and quality in Brangus cows on postweaning performance of crossbred calves sired by Bonsmara, Brangus, Charolais, Gelbvieh, Hereford, and Romosinuano sires in order to develop integrated cow-calf and stocker production systems. Preliminary results suggest that cow milk production does affect postweaning growth of her calf but the relationship depends on the sire breed of calf as well as whether the calf is managed as a wheat pasture stocker or backgrounded on mixed rations in drylot. These results will allow development of more efficient beef cattle production systems by properly matching cow milk production potential, calf sire breed, and calf postweaning management to meet desired system performance. Contact Dr. Michael A. Brown (mike.brown@ars.usda.gov) for additional information.



PERENNIAL COOL-SEASON GRASS CAN BE USED TO EXTEND THE WINTER WHEAT PASTURE GRAZING SEASON

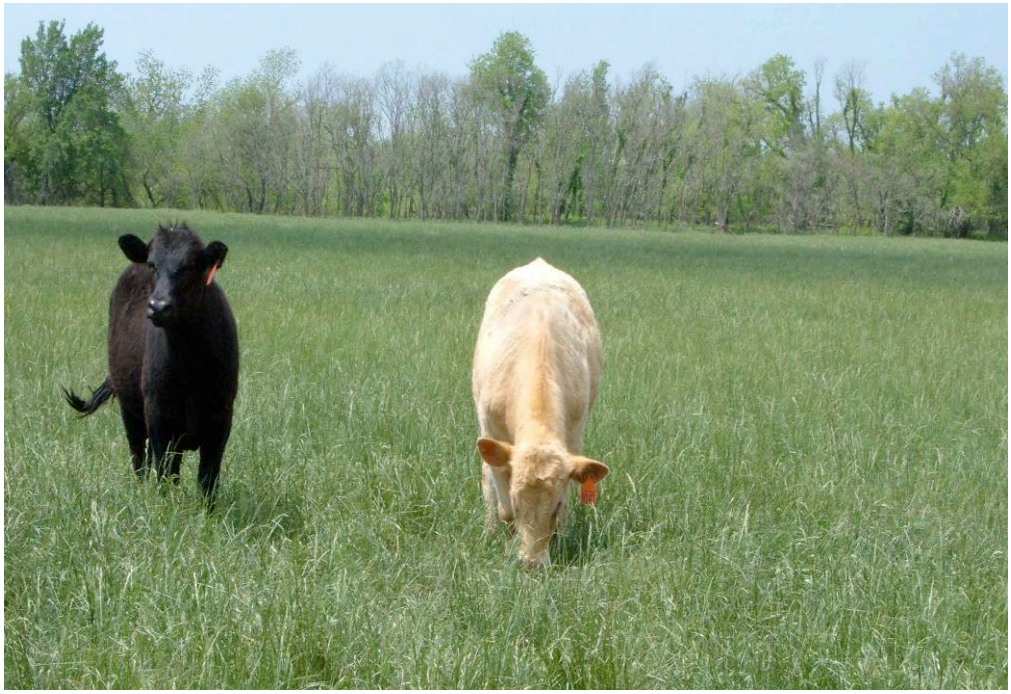
Research at the Grazinglands Research Laboratory used perennial cool-season grasses as a gap filling forage to lengthen the winter wheat pasture grazing season. Perennial cool-season pastures were grazed for short duration in the fall (October) prior to grazing winter wheat and again in the spring (May) after the winter wheat grazing season had ended. An additional 60 d was added to traditional grazing period. Steers gained an additional 77 lbs of body weight by grazing perennial cool-season grasses and were sold at heavier body weights in June. Steers are also marketed during a time of the year when fewer animals are in the market place. Steers entered the feedlot at heavier body weights, requiring fewer days and less feed grain to reach finish weight. This grazing management strategy can prevent the loss of perennial cool-season grass stands in the Southern Great Plains. Contact Dr. Bill Phillips (bill.Phillips@ars.usda.gov) or Dr. Brian Northup (brian.northup@ars.usda.gov) for additional information.

LOW-INPUT OVERSEEDING OF COOL-SEASON GRASS INTO WARM-SEASON PASTURE.

Work undertaken by staff of the Grazinglands Research Laboratory, at Langston, Oklahoma has shown that overseeding cool-season grass into dormant warm-season pasture can increase year-round forage production by an average of 20%, compared with unimproved warm-season pasture. The research has also shown that cool-season grass is nearly as productive when sown broadcast as when it is no-till drilled. Broadcast overseeding may be especially useful for farmers with limited access to specialized planting equipment. Contact Dr Paul Bartholomew (paul.bartholomew@ars.usda.gov) for additional information.

AN IMPROVED BREEDING TECHNIQUE FOR BLUEGRASS

Bluegrass represents a major grass species commonly utilized for both forage and turf. However, many bluegrass species exhibit a novel mode of reproduction where their offspring are genetically identical to the seed parent. This novel form of reproduction is known as apomixes. The apomictic reproductive nature of bluegrass forces breeding within the species to be time consuming and labor intensive endeavor. Research conducted at the Grazinglands Research Laboratory, has identified a novel method of utilizing a sexual reproducing native species, Texas bluegrass, to facilitate the development of genetically diverse and superior plant materials from apomictic bluegrass species. Studies to date have indicated that Kentucky bluegrass, Sandberg bluegrass and Argentine bluegrass work well with this approach. Preliminary studies with additional bluegrass species suggest the technique is likely widely applicable. The technique is highly efficient and has the potential to generate useful materials in as little as one generation. This new breeding approach offers a substantial savings in cost and time to bluegrass breeders and can be implemented readily in most breeding programs focused on the development of new and diverse bluegrass resources or cultivars. Contact Dr. Bryan Kindiger (bryan.kindiger@ars.usda.gov) for more information.



FORAGE SYSTEMS TO SUPPORT STOCKER CALF PRODUCTION

Researchers in the Forage and Livestock Production Research Unit, in collaboration with Noble Foundation scientists, are evaluating responses of yearling stocker cattle to combinations of forage types. Animal response and forage production are being measured on near farm-scale sized pastures of cool-season and warm-season grass and grass-legume mixtures, arranged in different replicated combinations. This evaluation will help provide the guidance necessary for beef producers in the southern Great Plains to develop new forage systems capable of supporting grazing by yearling stocker cattle on high quality forage for extended periods, and help reduce grain requirements for finishing cattle. Contact Dr. Brian Northup (brian.northup@ars.usda.gov) for more information.

GRASS PEA CAN REPLACE NITROGEN INPUTS IN BERMUDA PASTURES

The rising cost of commercial fertilizers has renewed interest in grass-legume forage systems. Inter-seeding grass pea not only increased total biomass but also improved nutritive value of Bermuda pasture. Grass pea contributed the equivalent of about 40 lb N per acre to Bermuda pasture, and produced sufficient high quality forage in the spring to allow the grazing to start one month earlier. For further information, contact Dr. Srinivas Rao (srinivas.rao@ars.usda.gov).

USING INVASIVE EASTERN REDCEDAR AS A BIOFUEL

Eastern redcedar (Juniperus virginiana L.) is an invasive species that seriously degrades prairie grasslands and adjacent landscapes in the southern Great Plains. Research is ongoing to 1) to investigate the use of redcedar as a biofuel source for rural economic development and 2) thereby improve grassland landscapes and enhance farm level economic productivity. Contact Dr. Brad C. Venuto (brad.venuto@ars.usda.gov) for more information.

CLIMATE DECISION SUPPORT HELPS ESTIMATE WINTER WHEAT GRAZING CAPACITY

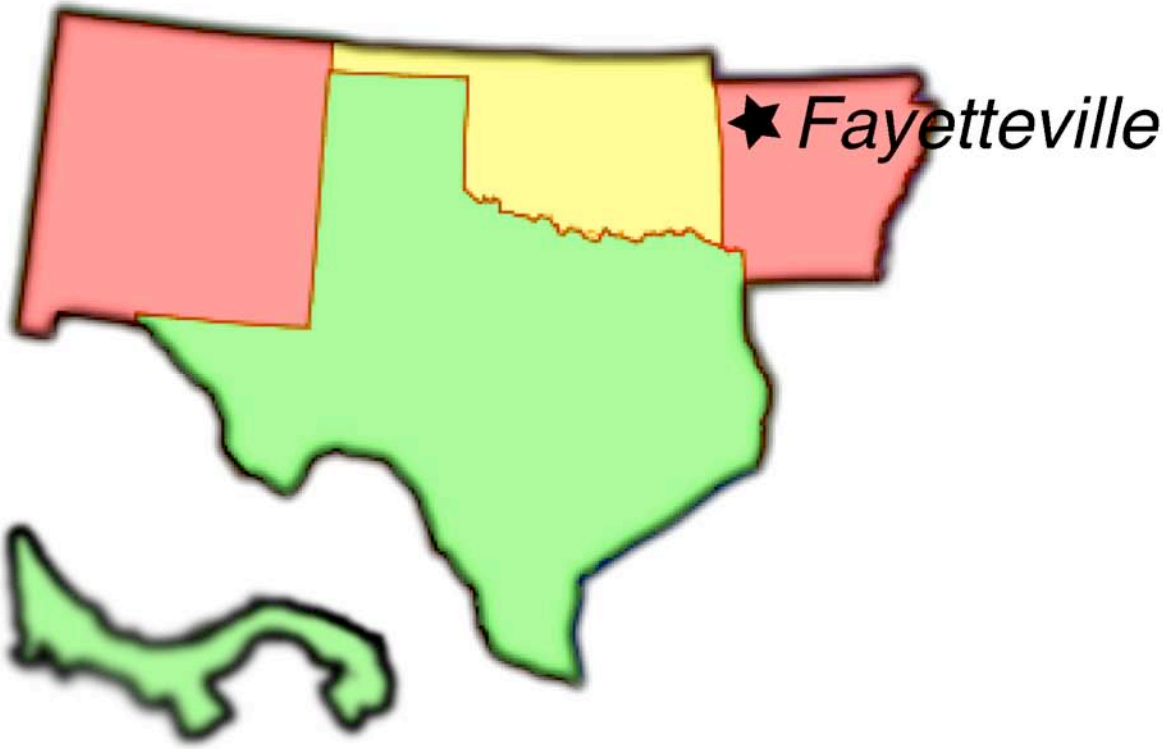
In the US Southern Plains, seasonal and year-to-year climate variations are pronounced and therefore make it difficult to anticipate forage availability, estimate the optimal number of cattle for grazing, and plan for a profitable grazing operation. A study was conducted to explore the potential of seasonal climate information to reveal grazing opportunities, reduce climate related risk, and increase profit margins for winter wheat grazing operations in central Oklahoma. Initial results indicated that strong seasonal climate forecasts, early in the forage production season, can lead to actionable decision information with regard to anticipating grazing capacity of winter wheat and influencing the cattle purchase decision. Also, the pronounced seasonal climate variations in the Southern Plains, with or without climate forecasts, are ideally suited to quantify climate related risk and present great opportunities for risk assessment and risk management of winter wheat grazing operations. Contact Jurgen Garbrecht (jurgen.garbrecht@ars.usda.gov) for additional information.

ACCELERATED AGING AND P-COUMARIC EFFECT CRIMSON CLOVER (*TRIFOLIUM INCARNATIUM L.*) SEED GERMINATION

In the field, seed in the soil are of various ages, ranging from newly deposited seed to seed that have been in the soil for several years. We have used a technique referred to as accelerated aging where seed are subjected to high temperature (41 C) and humidity (100%) for various time periods. The longer seed are held under these conditions, the greater the decline in germination and vigor. Using accelerated aged seed we were able to demonstrate that 10^{-3} M and 10^{-5} M p-coumaric acid reduced germination to a greater extent than aging or allelochemical alone. These results lead us to believe that older seed in the soil would be inhibited more than younger seed, thus affecting germination and subsequent seedling establishment. Contact Robert Williams (robert.williams@ars.usda.gov) for additional information.

NITROGEN USE AND BIOMASS DISTRIBUTION IN CULMS OF WINTER WHEAT POPULATIONS SELECTED FROM GRAIN-ONLY AND DUAL-PURPOSE SYSTEMS

Each year millions of stocker calves graze wheat pastures in the southern Great Plains to add weight before feedlot finishing. Often on more than 50% of these grazed pastures, the stockers are removed in time to allow the wheat to produce a grain crop. This dual-purpose (DP, grazing plus grain) use of wheat offers producers economic advantages not enjoyed by producers that grow wheat as a grain-only (GO) crop. Traditionally, the wheat cultivars used for DP were developed in GO production systems. Biomass distribution and N use traits for 12 sets of populations (each with unique genetic backgrounds) were used to test benefits of tailoring breeding programs for DP wheat. Biomass distribution and N use traits were measured at anthesis and grain maturity in individual culms of mass selected sub-populations derived from GO and DP production systems. Trait differences between DP and GO selections were often absent or only slight as compared to differences due to genetic background. Selections made from the DP environment performed similar to those from the GO environment when grown in either production system. These results will be useful to wheat breeders seeking to develop cultivars suitable for DP and GO use in the southern Great Plains. Contact Dr. Charles Mackown (charles.mackown@ars.usda.gov) for additional information.


Fayetteville

INVESTIGATING THE IMPACT OF STRESS ON FOODBORNE PATHOGEN COLONIZATION IN TURKEYS

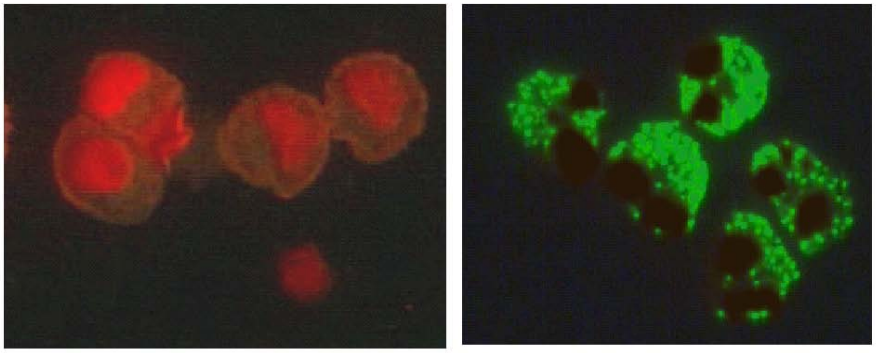
Researchers at the Poultry Production and Product Safety Unit, Fayetteville, AR are studying the effects that common stressors of commercial turkey production, including Escherichia coli respiratory disease (airsacculitis), moving and transport, and temperature extremes, can have on pre-harvest contamination of turkeys with pathogens of food safety importance. Stress models are used to develop a basic understanding of how turkey immunity is affected by stress and will lead to the development and application of practical strategies to improve product safety. Contact Dr. Gerry Huff (gerry.huff@ars.usda.gov) for additional information.

TARGETING BONE DISEASE IN POULTRY

Researchers at the Poultry Production and Product Safety Research Unit are studying differentially expressed proteins and peptides to identify biomarkers relating to poultry skeletal disease tibial dyschondroplasia (TD) and femoral head separation and necrosis. They are also identifying bioactive peptides associated with chicken macrophages and heterophils. Their studies found that these cells, which kill pathogens, display different peptide patterns. Two highly expressed peptides in macrophage and heterophils are thymosin beta-4 and beta defensins respectively. Contact Dr. Narayan Rath (narayan.rath@ars.usda.gov) for additional information.

Femoral Head Separation and Necrosis

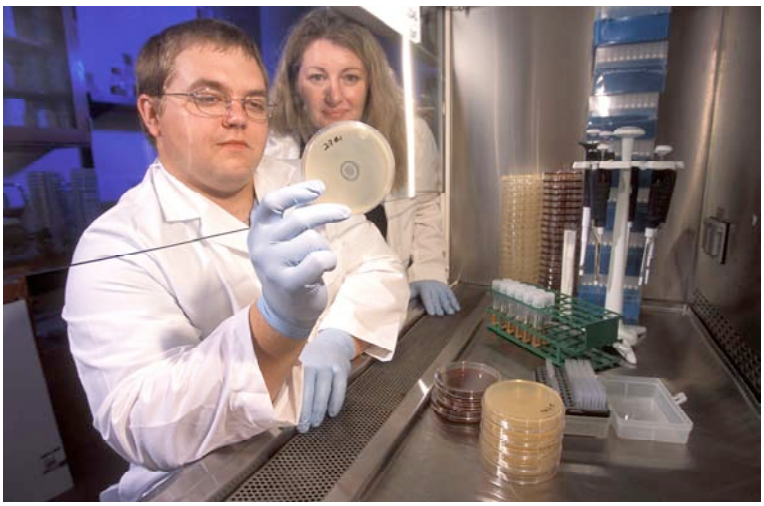
Tibial Dyschondroplasia (TD)



Chicken Macrophages and Heterophils

NATURAL ANTIMOICROBIAL COMPOUNDS EFFECTIVE AGAINST FOOD BORNE PATHOGENS IN POULTRY

Researchers at the Poultry Production and Product Safety Unit, Fayetteville, AR are studying ways to improve the efficacy of probiotics, essential oils and other natural compounds on reducing *Salmonella* and *Campylobacter* in poultry. For example, the Fayetteville team including University of Arkansas researchers developed a novel strategy for selecting potential prebiotic bacteria able to out compete pathogens in vitro. Product developed from this research was field tested by Cargill Turkeys Inc. in millions of birds from Arkansas, Missouri and Virginia resulting in notable reduction in pathogen contamination, mortality, and improved health of young poults. The strategy was patented and made commercially available in 2004 (~100 million birds treated). Extrapolating current data, which indicates chickens and turkeys treated with this probiotic results in increasing meat yields which translates to a greater than 6 million dollar increase in production yields for every 300 million birds treated in the US/year. Contact Dr. Annie Donoghue (annie.donoghue@ars.usda.gov) for additional information.

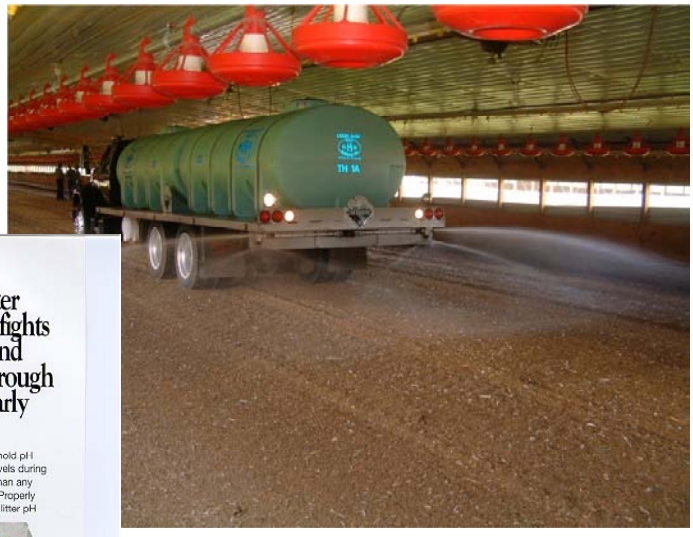


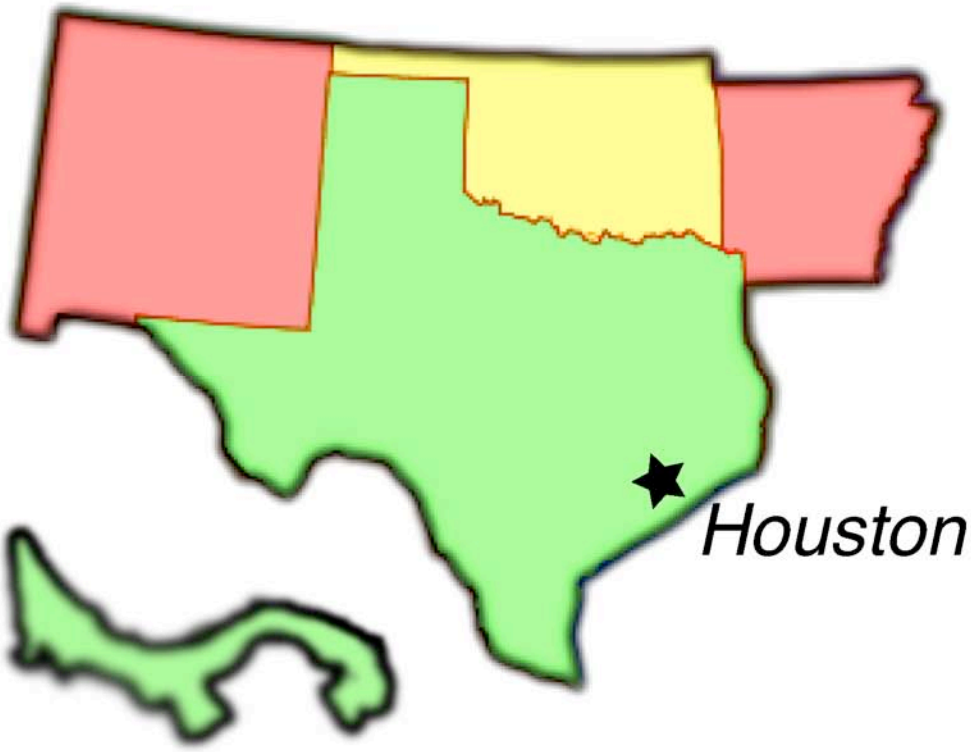
ORGANIC AND SPECIALTY POULTRY PRODUCTION

Researchers at the Poultry Production and Product Safety Unit, Fayetteville, AR are studying specialty poultry production, including free-range and organic, and small flocks for local food production. They are interested in using natural remedies to maintain gut health and reduce parasites and to prevent food-borne pathogens. The use of choice feeding systems allow birds in open housing and with access to the outdoors to better adjust energy needs with temperature swings and is appropriate for birds that obtain additional nutrients on range/pasture. They are also researching integrated systems of poultry, livestock, and agroforestry production, commonly used on small farms and are collaborating with scientists at the Booneville Unit on these efforts. Contact Dr. Anne Fanatico (anne.fanatico@ars.usda.gov) for additional information.

ENVIRONMENTALLY FRIENDLY POULTRY PRODUCTION

Research at the Poultry Production and Product Safety Unit, Fayetteville, AR led to the development of “Al+Clear”, which is poultry grade alum. When alum is applied as a liquid or solid to poultry litter, it reduces ammonia emissions and pathogens in litter, resulting in heavier birds, better feed conversion and lower mortality. Lower emissions of ammonia not only improve air quality, it results in lower energy use, due to lower ventilation requirements in winter months. Alum additions to litter also improve water quality, by reducing phosphorus, heavy metals, and estrogen in runoff water. Due to improvements in bird performance, approximately one billion broilers are grown with alum each year. This technology was patented by University of Arkansas and USDA/ARS and was licensed to General Chemical Corp. Contact Dr. Philip Moore (philipm@uark.edu) for additional information.



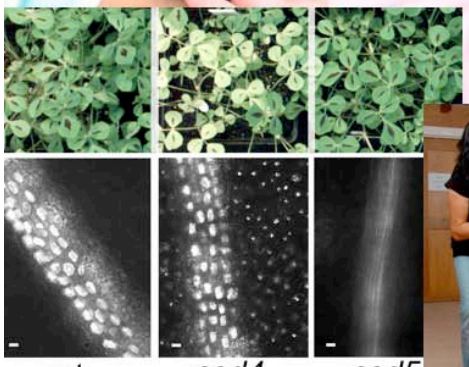

Houston

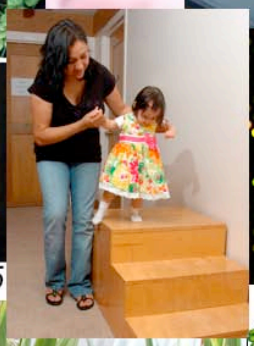
USDA-ARS
Children's Nutrition Research Center
Houston, Texas

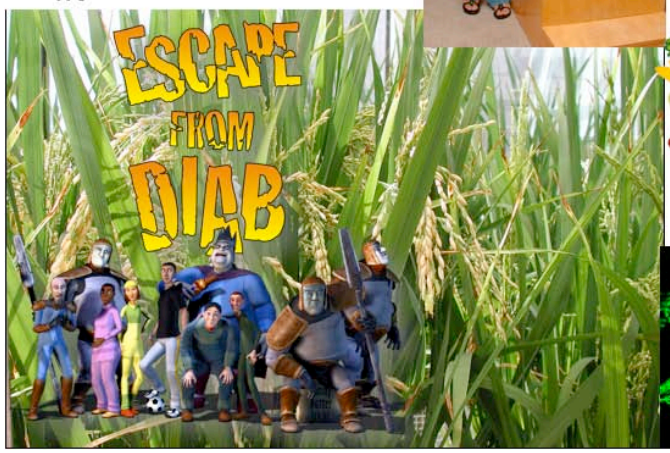
USDA

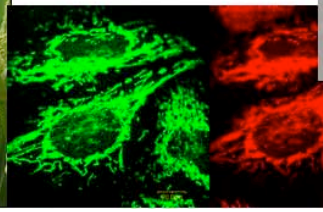
BCM
Baylor College of Medicine

Studying Nutrition Today for the Health of Future Generations







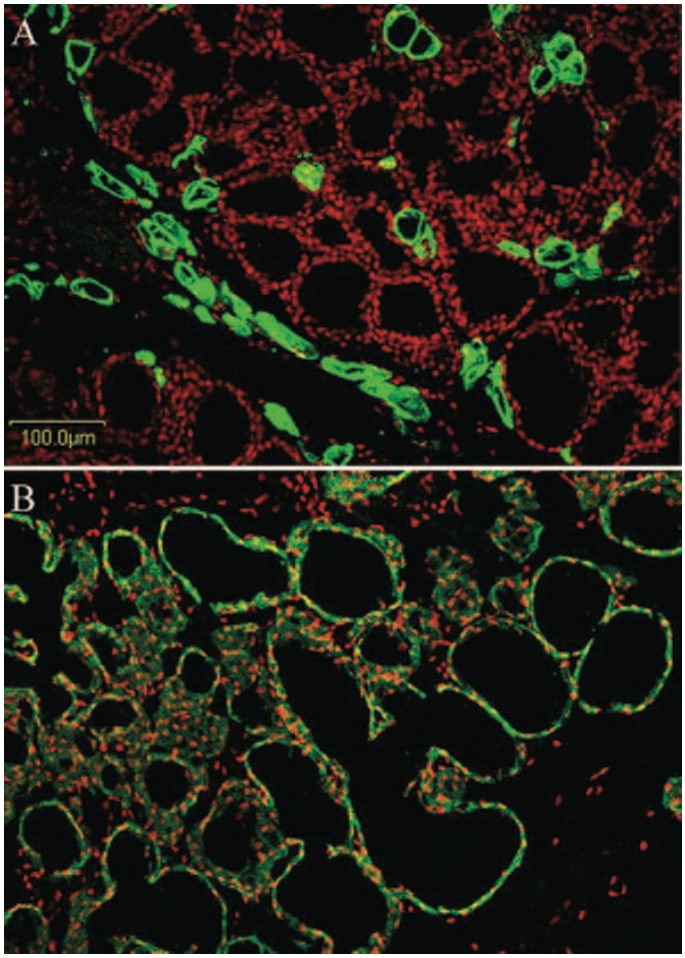


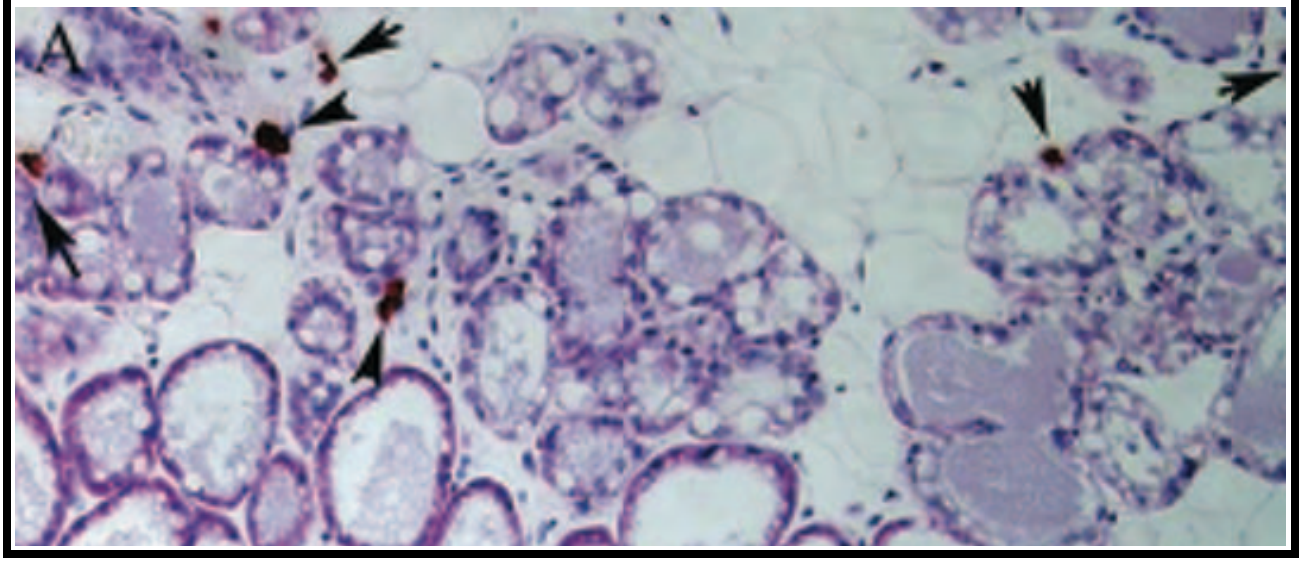
MISSION STATEMENT OF THE CHILDREN'S NUTRITION RESEARCH CENTER

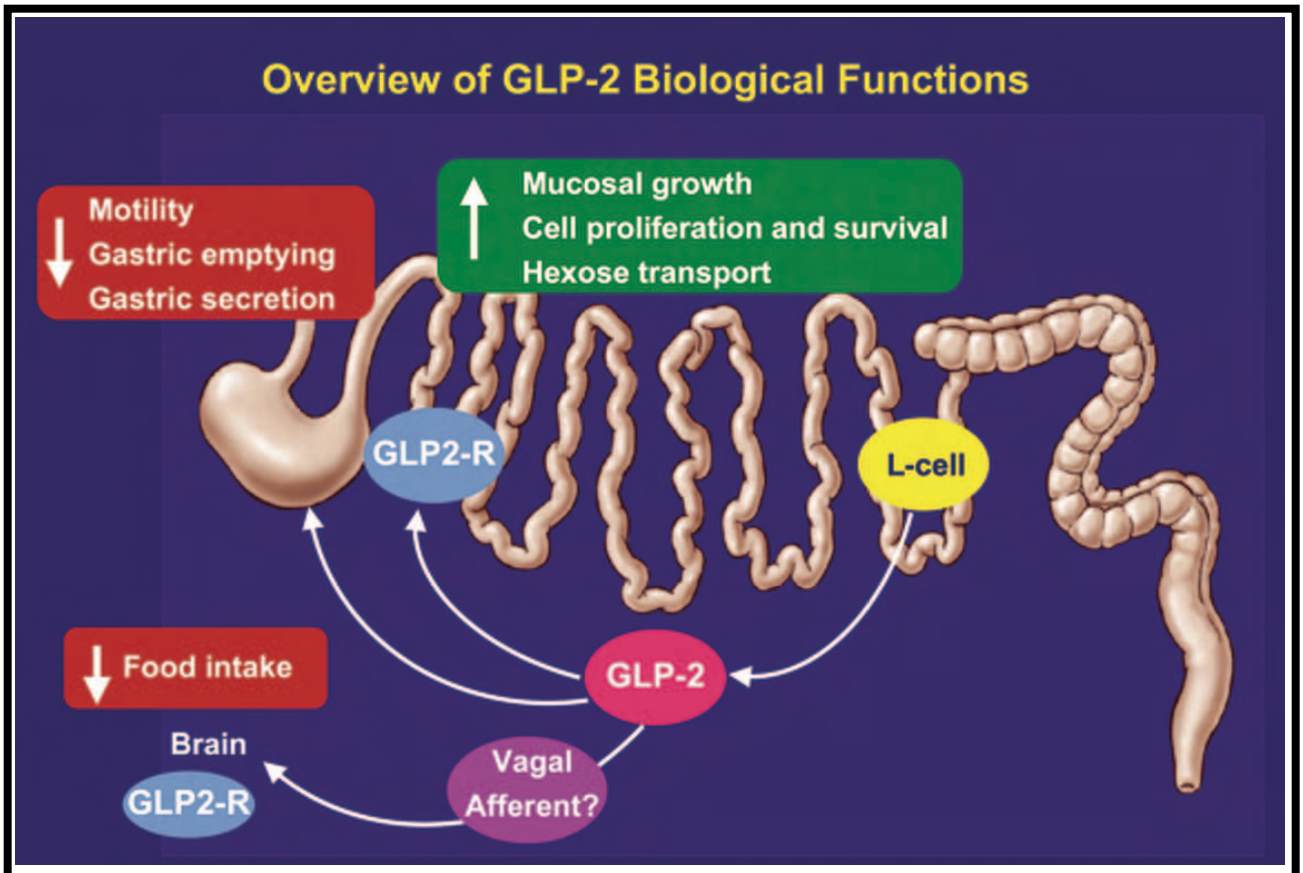
The mission of the Children's Nutrition Research Center is to define the dietary needs that will assure health in pregnant and lactating women and in children from conception through adolescence. Objectives are to 1) determine the role of nutrition and specific nutrients in optimal prenatal development, including which nutrients consumed by a mother near the time of conception, and during pregnancy and lactation, positively affect infant health and the course of human development; 2) investigate nutrient-gene interactions to determine both how gene expression is regulated by dietary nutrients and how differences in genotype affect the absorption and utilization of common nutrients by individuals; 3) identify the specific nutritional factors necessary for optimal health, growth, and development of newborn term and pre-term infants and children of all ages; 4) identify regulatory controls of body weight and body composition during infancy and childhood, and metabolic and behavioral factors that regulate energy intake, energy expenditure, appetite, and satiety; 5) identify childhood dietary habits that contribute to long-term health and the prevention of diet-related chronic diseases in adulthood, including osteoporosis, obesity, hypertension, diabetes, cardiovascular disease, and cancer; 6) investigate the biochemical regulation of phytonutrients in plant foods, the importance of specific phytonutrients in optimal childhood growth and development, and the bioavailability of minerals, such as iron, zinc and calcium, from plant sources; 7) investigate the developmental origins of obesity, cardiovascular disease, and other chronic diseases of nutritional lineage; and 8) identify the nutritional regulation of cell and organ growth, differentiation, and development.

INCREASING MOTHER'S MILK VOLUME

Only 36% of women who choose to exclusively breastfeed their babies are able to do so out to the currently recommended age of 6 months. The most common reason cited for early cessation of breastfeeding is insufficient milk volume. This inability to maintain lactation is exacerbated by obesity. Researchers at the Children!s Nutrition Research Center are studying factors that affect milk volume; specifically mammary cell turnover, mammary cell biosynthetic activity, and endocrine and whole body metabolic activity. Contact Darryl Hadsell, PhD (dhadsell@bcm.edu) for more information.

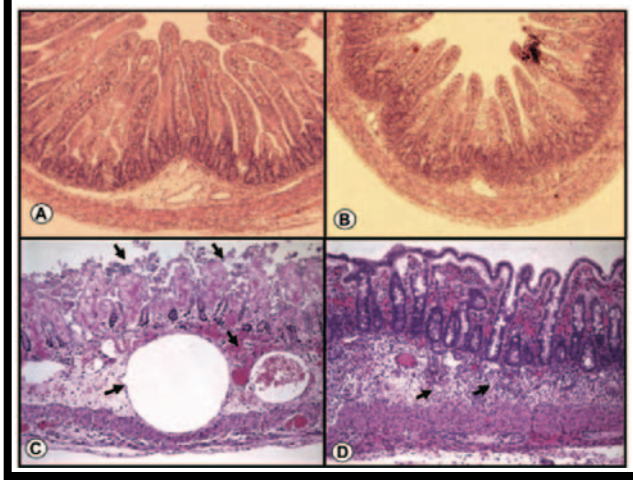




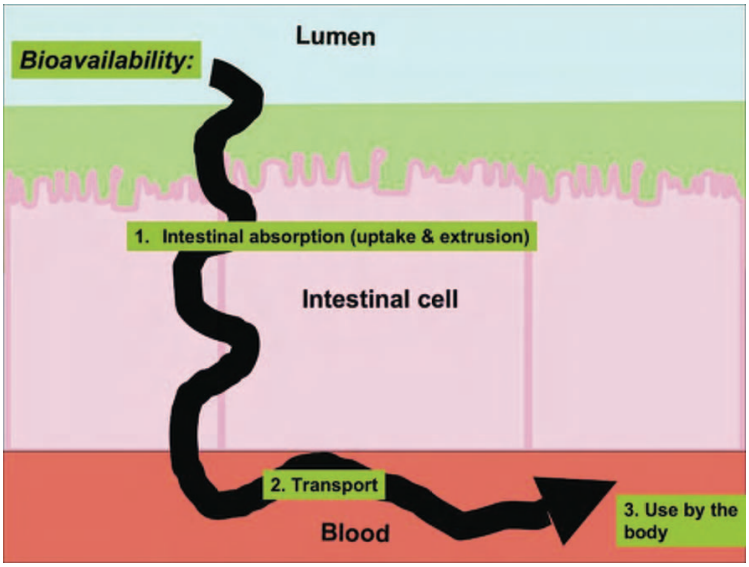


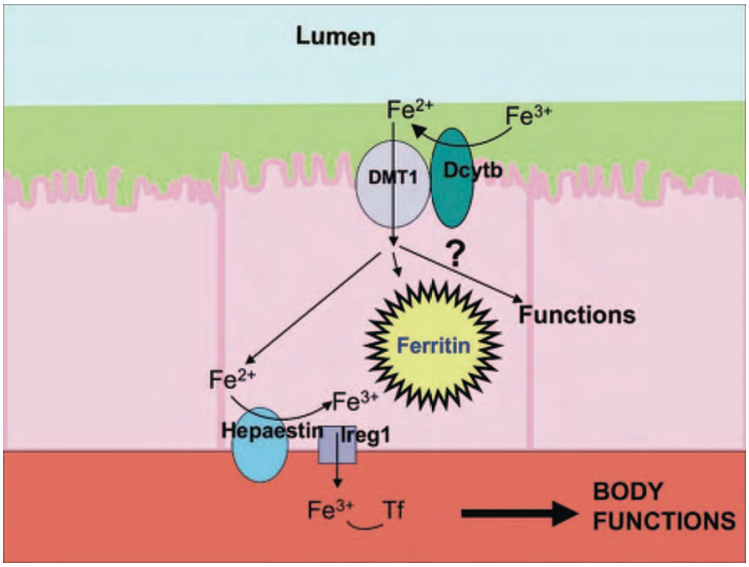
NUTRITIONAL IMPACT ON PEDIATRIC GUT DEVELOPMENT

Researchers at the Children!s Nutrition Research Center are conducting several basic and translational research projects designed to establish how oral nutrition, intestinal hormones, and gut flora stimulate intestinal adaptation, maintain function and prevent disease in premature infants, such as necrotizing enterocolitis (NEC) and hepatic steatosis. Researchers have established unique models of parenteral (intravenous) nutrition and NEC using a newborn animal model to address clinically-relevant problems in pediatric nutrition and gastroenterology. Contact Douglas Burrin, PhD (doug.burrin@ars.usda.gov or dburrin@bcm.edu) for more information.

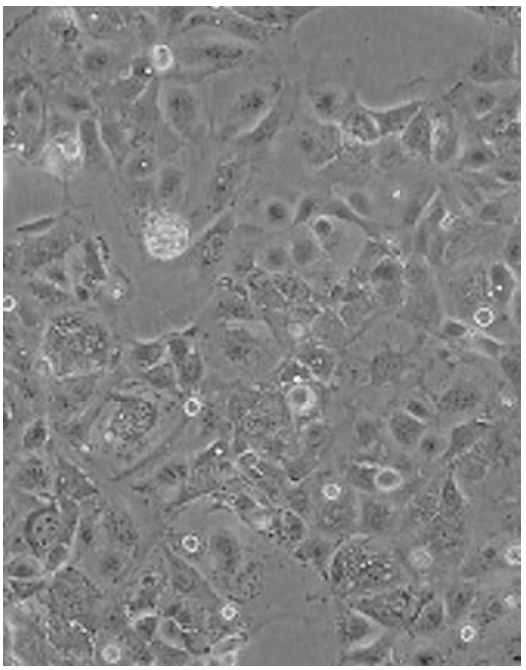


PLANT GENETIC TRAITS THAT AFFECT HUMAN ABSORBABILITY



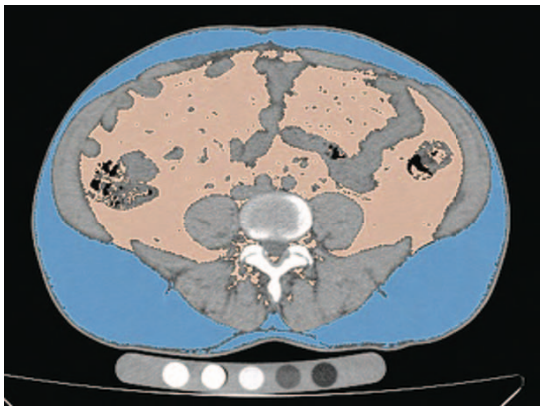


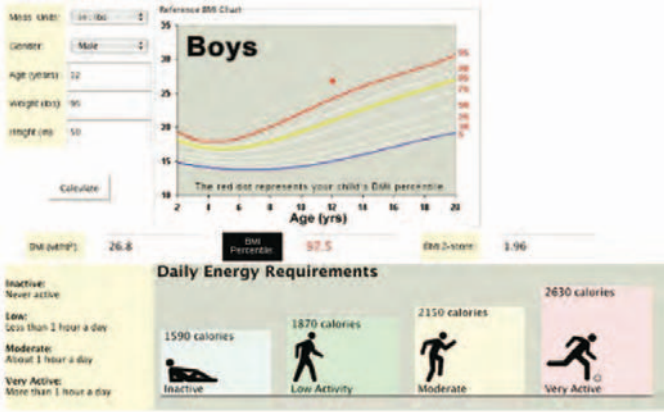
CNRC Researchers are studying how absorbable zinc and iron minerals are from plant foods. Scientists are evaluating numerous plant lines to identify those providing the most absorbable form of these minerals. This data will inform scientists of specific plant genetic traits that modulate absorbability. Contact Paz Etcheverry, PhD (paze@bcm.edu) for more information.

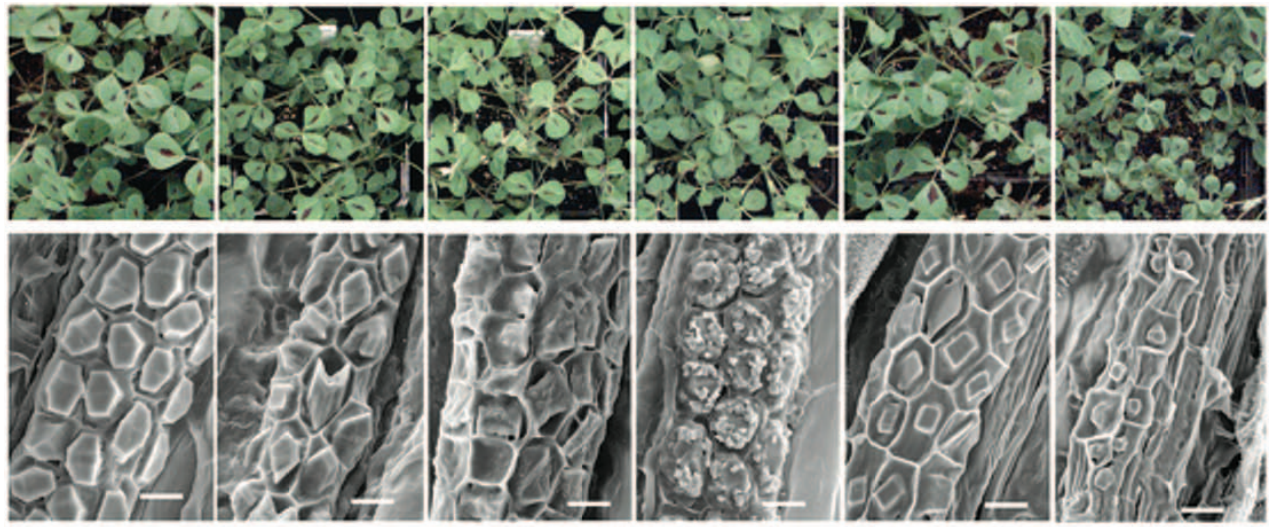


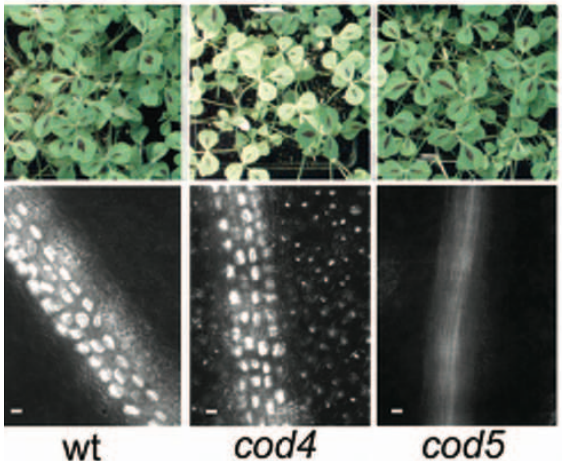
ESTABLISHING REFERENCE STANDARDS FOR DIVERSE BODY COMPOSITIONS IN DIFFERENT ETHNIC GROUPS

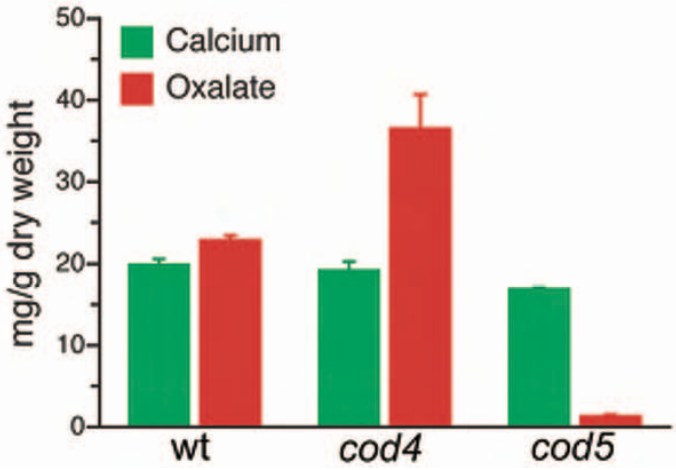
CNRC scientists are working to establish reference standards for the biological diversity in body composition from birth to young adulthood in different ethnic groups. This research focuses on the development and application of advanced physics techniques for studies of the human body. This approach provides unique insights into the changes in the body!s skeletal size and density, muscle mass, and body fat during critical phases of normal growth. Information learned for healthy children provides the references necessary for assessing the nutritional status of children with diseases. Contact Kenneth Ellis, PhD (kellis@bcm.edu) for more information.





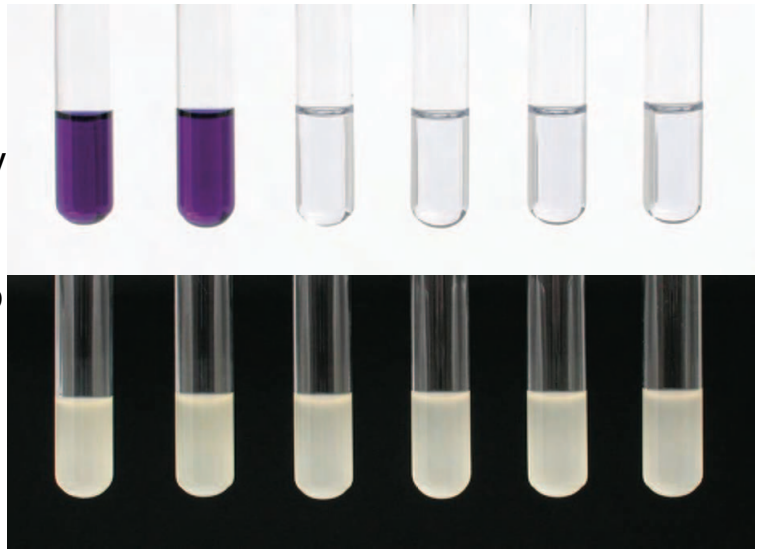






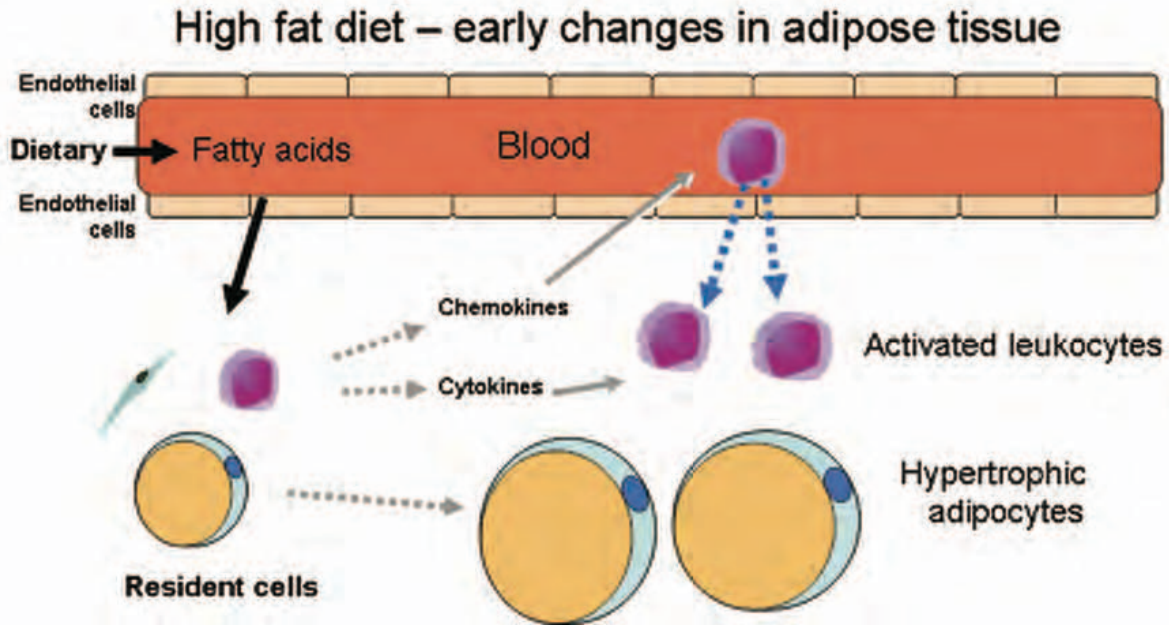
ENHANCING PLANT CALCIUM AVAILABILITY

Research at the Children!s Nutrition Research Center has lead to the technology to enhance calcium bioavailability in plants through the removal of calcium oxalate crystals. Transfer of this technology into crop plants is underway. Contact Dr. Paul Nakata (paul.nakata@ars.usda.gov) for additional information.



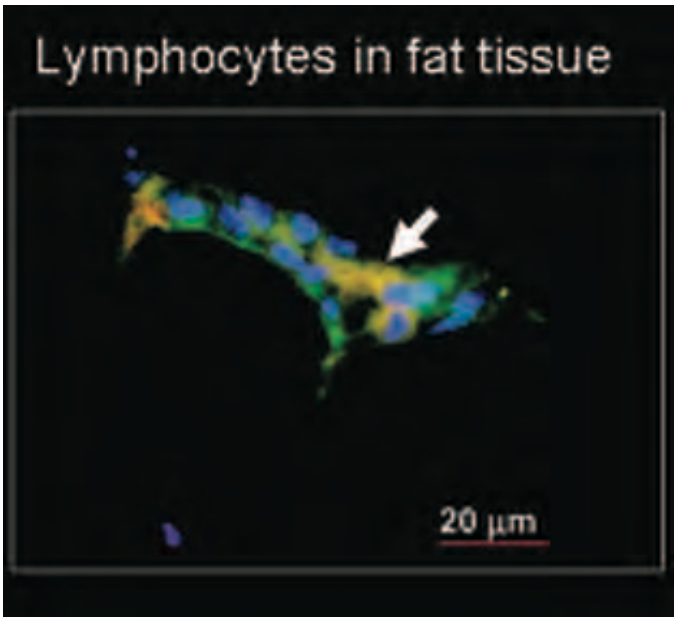
UNDERSTANDING PARENTAL FEEDING STYLES AND HOW PARENTAL BEHAVIOR IMPACT CHILD DIETARY INTAKE

Researchers at the Children!s Nutrition Research Center are studying how parents socialize their children around eating and how these patterns of parent socialization impact children!s health and development; specifically, how parent feeding styles and other parenting behaviors influence child dietary intake and adverse eating behaviors in childhood. This includes parenting, feeding patterns, parental affect, and child temperament, including the measurement of these constructs in low-income populations. Contact Sheryl Hughes, PhD (shughes@bcm.edu) for more information.



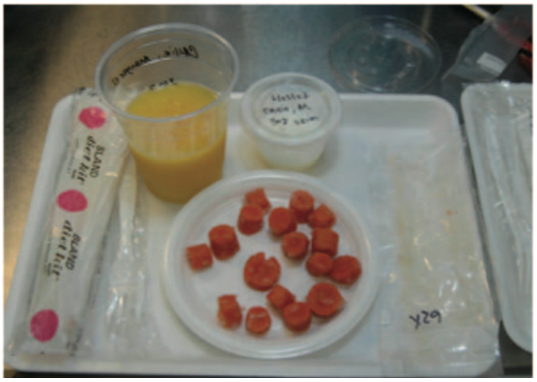
THE EFFECTS OF DIET-INDUCED OBESITY ON TISSUES AND VITAL ORGANS

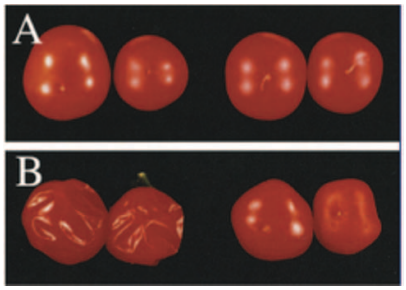
Researchers at the Children!s Nutrition Research Center are studying the effects of diet-induced obesity on the inflammatory processes in fat tissue, liver and blood. Research is being conducted to define the roles of macrophages and lymphocytes in adipose tissue, and to define the relationship between fat tissue inflammation and liver disease. Contact C. Wayne Smith, MD (cwsmith@bcm.edu) for more information.

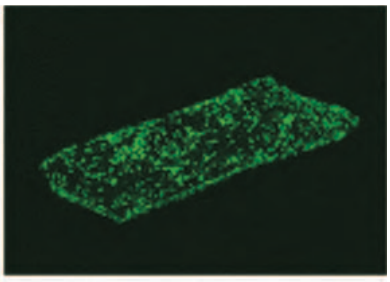


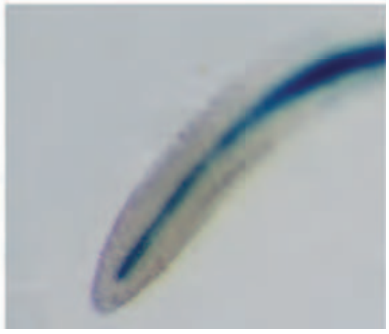
ENHANCING PLANT NUTRITION THROUGH SCIENCE

Plant researchers at the CNRC perform translational research related to agricultural improvement at the molecular level by understanding the structure, biological function, and regulation of transporter plant proteins. Such research is important as scientists learn how to manipulate the expression and function of these transporter proteins to increase the nutritional content of crop plants, improve plant productivity, and cleanse polluted soils. Contact Kendal Hirschi, PhD (kendalh@bcm.edu) for more information.



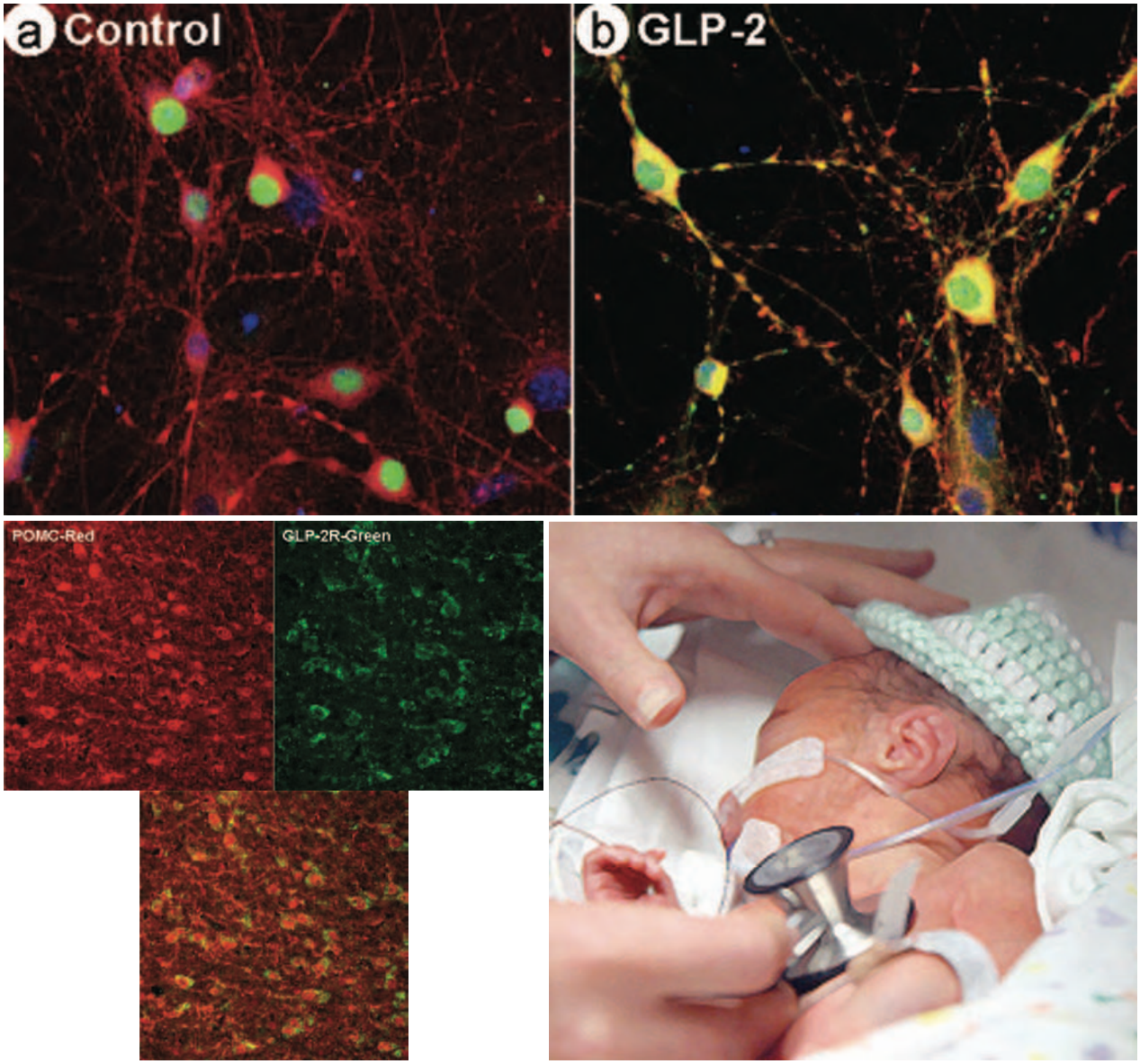






DECREASING CHILDHOOD OBESITY THRU PEDIATRIC CLINICS

Researchers at the Children!s Nutrition Research Center are attempting to understand how parents influence their children!s eating, activity, and television-viewing behaviors by implementing an obesity prevention intervention in community pediatric primary care clinics. This research targets parents and their 5-8 year old child to promote authoritative parenting practices to improve their child!s eating, activity and television-viewing behaviors, and thereby impact the child!s weight status. Contact Teresia O!Connor, M.D. (teresiao@bcm.edu) for more information.

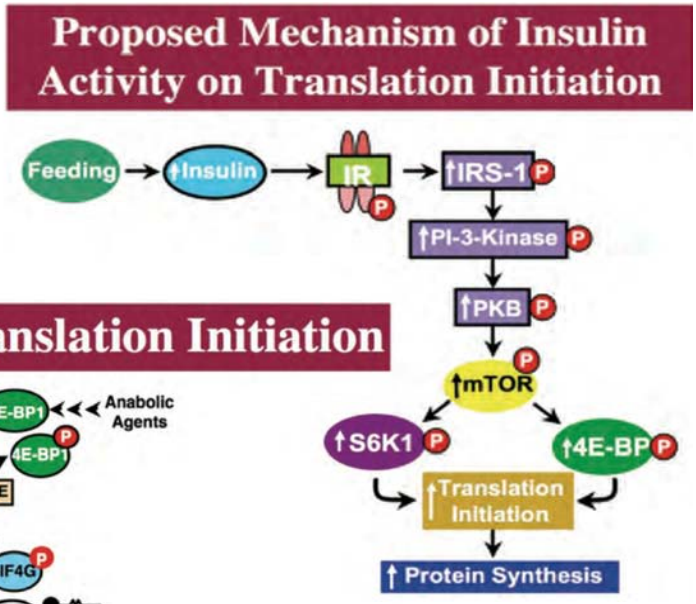


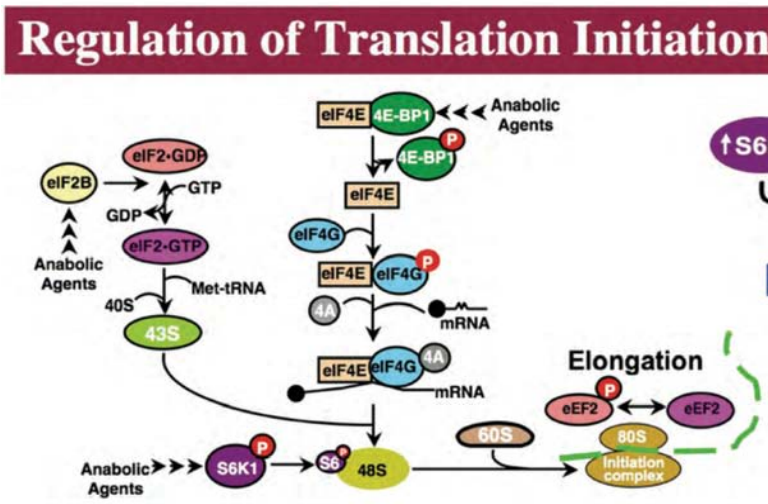
UNDERSTANDING THE ROLE OF PEPTIDES IN TREATING INTESTINAL DYSFUNCTION AND IMPROVING HYPOGLYCEMIA

Researchers at the Children!s Nutrition Research Center are researching the cellular and molecular mechanisms by which nutrients and hormones interact to control newborn infants intestinal development, growth, and function, and energy homeostasis. One key nutrient-responsive gut neuropeptide is glucagon-like peptide 2 (GLP-2) which plays a key physiological role in the control of gut growth and function, intestinal blood flow, food intake, and glucose homeostasis. Research in this area will provide critical mechanistic information that may lead to development of GLP-2 as a therapeutic strategy to treat intestinal dysfunction (e.g., necrotizing enterocolitis and short-bowel syndrome) and improve hypoglycemia. Contact Xinfu Guan, Ph.D. (xguan@bcm.edu) for more information.

FACTORS THAT IMPACT SKELETAL MUSCLE DEVELOPMENT IN NEWBORNS

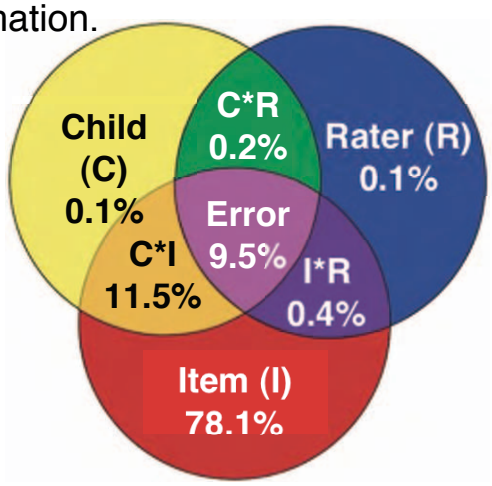
Children!s Nutrition Research Center scientists are conducting studies to identify the mechanisms by which nutrients, hormones, and other growth factors impact skeletal muscle during growth and development of newborns. Scientists are evaluating the role of insulin, amino acids, and glucose, as well as other nutrients and hormones in the regulation of muscle protein synthesis. This research aims to identify strategies that optimize nutrient utilization for growth, which is important for improving the outcome of growth-retarded infants and to improve animal production. Contact Teresa Davis, PhD (tdavis@bcm.edu) for more information.





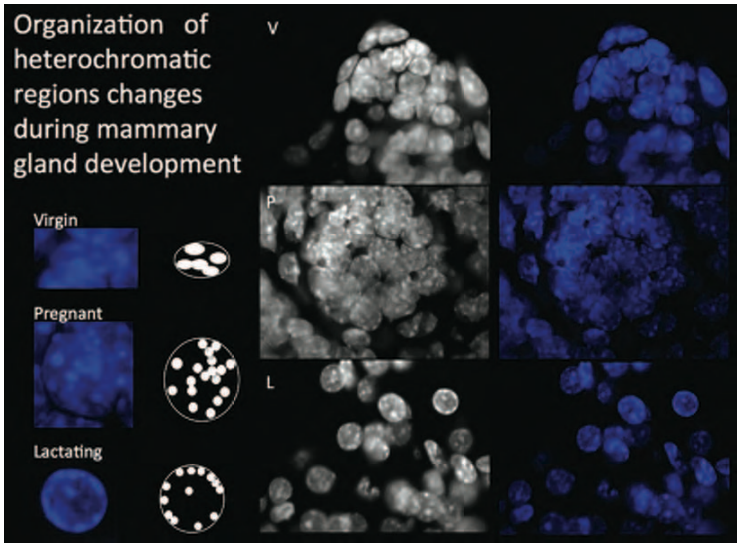
STOP THE BUS! – USING A WALKING SCHOOL BUS TO PREVENT OBESITY IN CHILDREN

A pediatrician researcher at the Children!s Nutrition Research Center is working in areas that include obesity and cancer prevention in children, with a focus on minority and socioeconomically disadvantaged groups. Research is conducted through school- based interventions to reduce sedentary activities, such as watching television and videos, among Hispanic children in Head Start; and through the evaluation of a “Walking School Bus” program, i.e. a group of children led to and from school by several responsible adults, in collaboration with the Houston Independent School District and other local agencies. Contact Jason Mendoza, MD (jason.mendoza@bcm.edu) for more information.



Venn Diagram for Sources of Variance for the Pedestrian Safety Behaviors Checklist Using Generalizability Theory

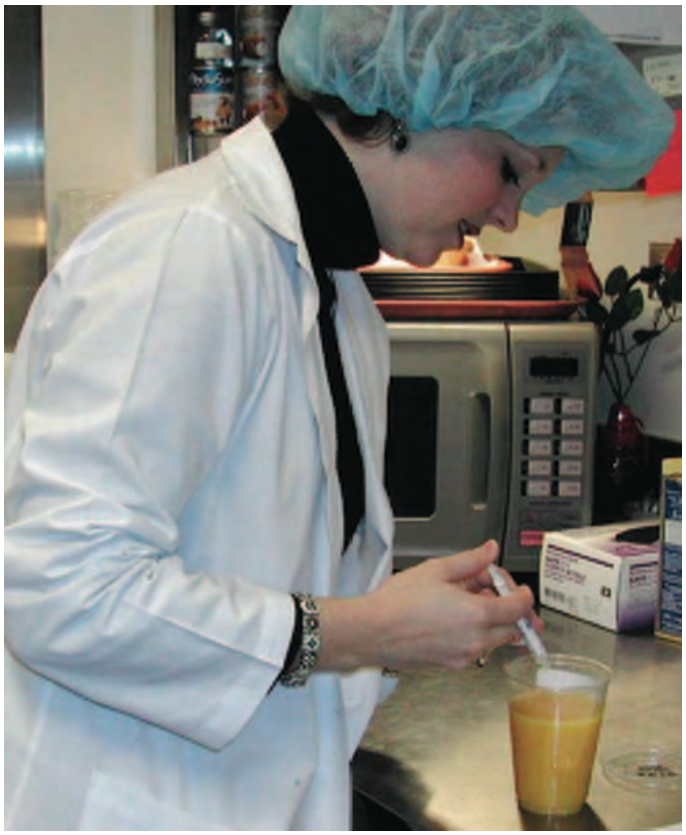
SCIENTIFIC STUDIES TO UNDERSTAND MAMMARY GLAND DEVELOPMENT AND FACTORS THAT INFLUENCE LACTATION

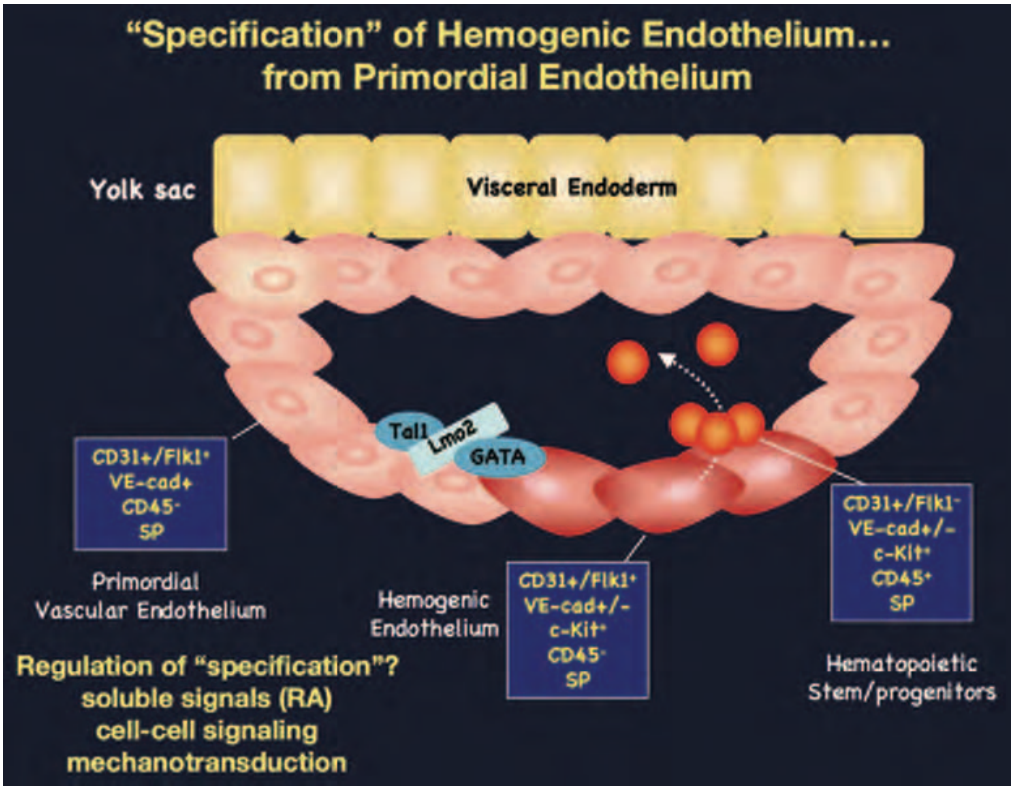


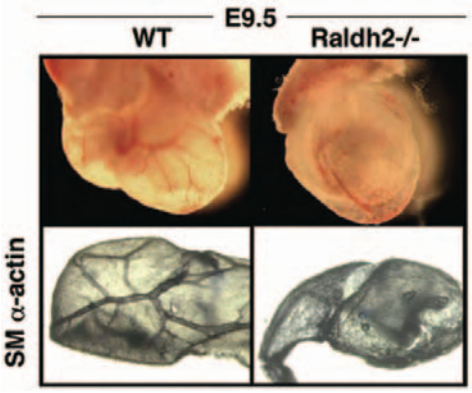
Milk is the primary source of nutrition for newborns and has been shown to provide significant health benefits. However, it has been shown that milk production capacity and the expression of specific milk components that present health benefits vary between women. Children!s Nutrition Research Center scientists are studying this variation which impacts the mother!s ability to breastfeed according to recommendations and the value of her breastmilk to the recipient infant. Researchers are working to understand the underlying mechanisms through which lactation is established and maintained or in which variation in mammary gland function arises. A more in-depth knowledge of the factors and pathways regulating mammary gland development and lactation will provide insight into how these processes can be manipulated to benefit mother and child. Contact Monique Rijnkels, PhD (rijnkel@bcm.edu) for more information.

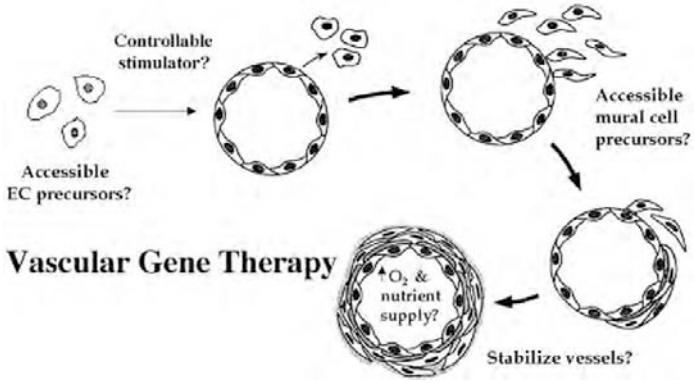
IDENTIFYING THE OPTIMAL FORMS AND QUANTITY OF IRON AND ZINC FOR SMALL CHILDREN

Researchers at the CNRC are focusing on the mineral nutritional needs of infants, children and adolescents, specifically calcium and bone mineral requirements. Additional studies are aimed at identifying the optimal forms and amount of iron and zinc to provide to small children, especially those who live in developing countries, where iron deficiency anemia and zinc deficiency are extremely common. Contact Steven A. Abrams, MD (sabrams@bcm.edu) for more information.









COMPREHENDING FACTORS THAT MODULATE BLOOD AND BLOOD VESSEL FORMATION

Researchers at the Children!s Nutrition Research Center are working to understand, at the cellular and molecular level, the events leading to blood and blood vessel formation, and the impact of specific nutrients such as retinoic acid on these processes. Another focus of the laboratory is investigating the potential of human adult and pluripotent stem cells to contribute to new blood vessel formation during tissue repair and regeneration. The mechanisms by which such stem cells are induced to differentiate into vascular cells, and are functionally integrated into vascular networks, are of particular nterest. Contact Karen Hirschi, PhD (khirschi@bcm.edu) for more information.

NUTRITIONAL MODIFICATION FOR THE PREVENTION OF INTESTINAL DISEASES IN CHILDREN WHERE HUNGER IS OF GREATEST CONCERN

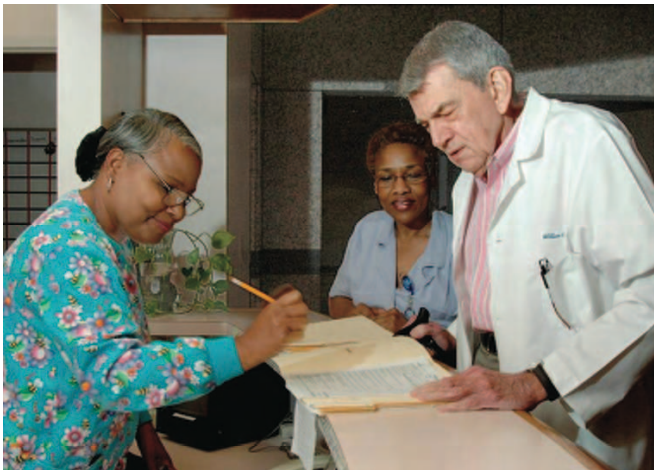
CNRC scientists are studying the different aspects of nutrition in populations of rural America and in developing countries, specifically in Malawi, Africa. Diseases developing in the intestine are ubiquitous in children of developing countries, and its role in nutritional compromise is not well understood. Research is underway to understand the gut function and nutritional consequences in remote populations where hunger is of critical concern. Contact Mark Manary, M.D. (manary@kids.wustl.edu) for more information.

YOUTH OBESITY PREVENTION THROUGH PROMOTING POSITIVE BEHAVIORS THRU MULTIMEDIA

Children!s Nutrition Research Center behavioral scientists are looking at youth obesity prevention through the promotion of positive behaviors, such as consuming more fruit, vegetables, and water, and by being more physically active and less physically inactive. To achieve this, researchers are designing, developing, and evaluating: interactive multimedia programs (e.g., web-based programs; videogames); optimal health message design; and theory and measurement of models of youth diet and physical activity behavior. Contact Debbe Thompson, PhD (deborah.thompson@ars.usda.gov or dit@bcm.edu) for additional information.

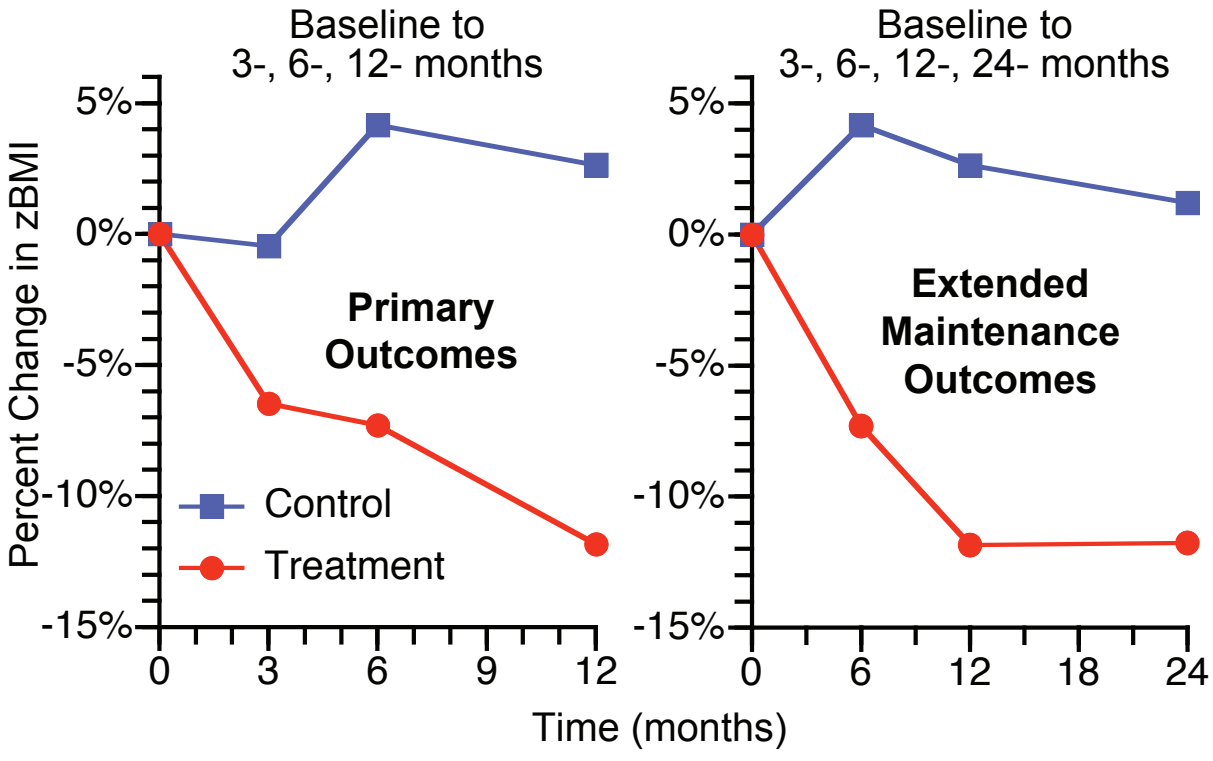
UNDERSTANDING THE NUTRIENT NEEDS OF LOW-BIRTH-WEIGHT INFANTS

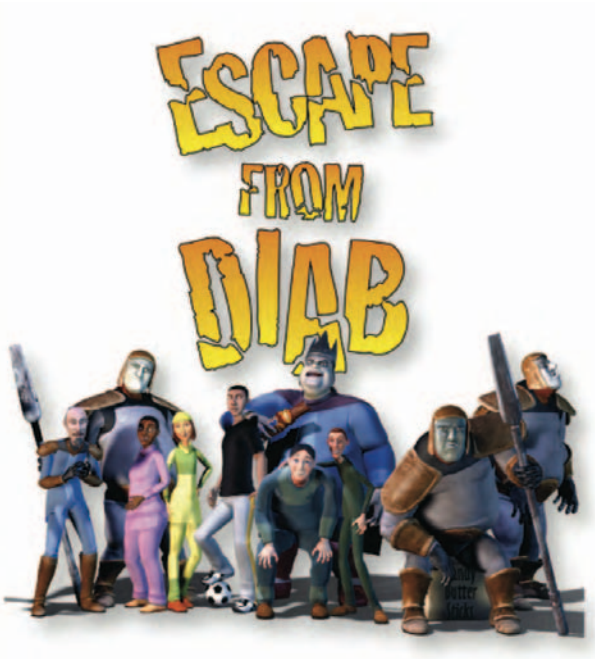
Researchers at the Children!s Nutrition Research Center are studying the nutrient needs of infants and children, particularly low-birth-weight infants and infants who depend upon intravenously delivered nutrients, as well as ways of meeting these nutrient needs. Additional studies address the metabolism of essential fatty acids during infancy and childhood and the role of long-chain polyunsaturated fatty acids in infant development. Contact William Heird, M.D. (wheird@bcm.edu) for more information.



GOING WITH THE "FLOW" FOR THE PREVENTION OF OBESITY IN AT-RISK YOUTH

Researchers at the Children's Nutrition Research Center are conducting the Family Lifestyle Overweight (FLOW) Prevention Program which is designed to determine the effectiveness of a self-help intervention versus a community-based, instructor-led, multi-component physical activity and nutrition intervention for 10-15 year-old children and adolescents who are at risk for obesity. The intervention uses a behavioral approach for weight management and stresses the importance of balancing exercise and healthy nutrition in a family-based environment. Contact John Foreyt, PhD (jforeyt@bcm.edu) for more information.



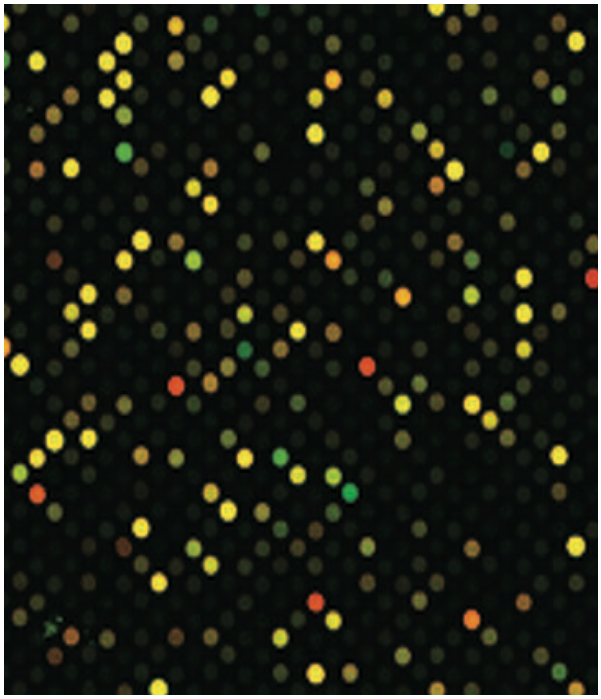


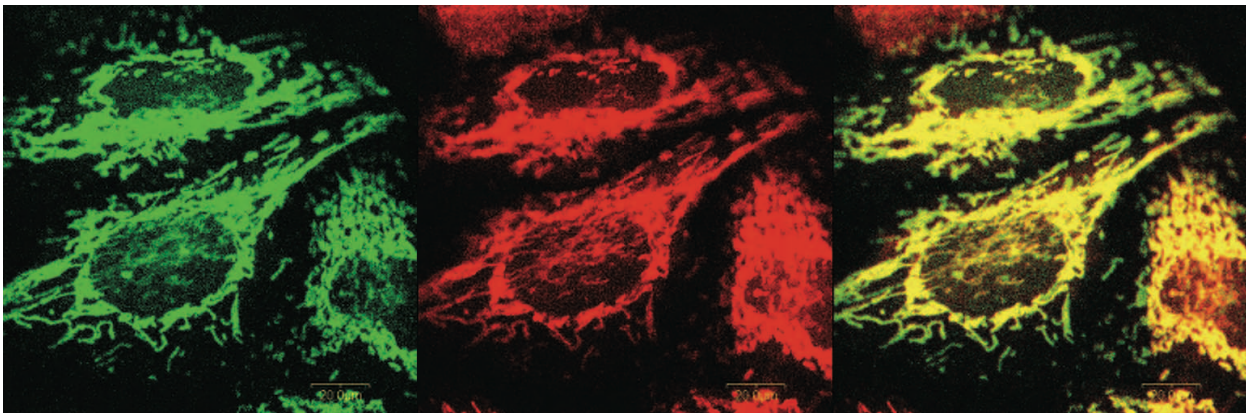
CHANGING CHILDREN AND FAMILIES DIETARY AND PHYSICAL ACTIVITY BEHAVIOR THROUGH INNOVATIVE TECHNOLOGIES

Children's Nutrition Research Center behavioral scientists are conducting research on obesity and chronic disease prevention among children and their families, specifically why children eat the foods and engage in the physical activities they do. Researchers are designing, implementing and evaluating various programs to help children and their families change dietary and physical activity behaviors. Unique studies conducted by this research team include conducting formative research for a videogame to train parents to deliver authoritative food parenting practices to young children; and formative research for a videogame to train children to ask their parents to have more fruit and vegetables available at home when otherwise not available. Contact Tom Baranowski, PhD (tbaranow@bcm.edu) for more information.

EFFECTS OF MATERNAL OBESITY AND NUTRITION ON THE OFFSPRING

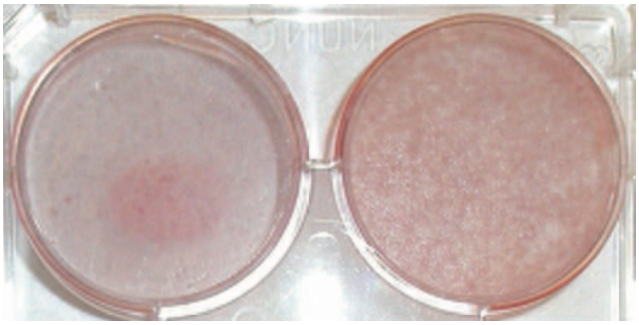
Children!s Nutrition Research Center scientists are aiming to understand how nutrition during prenatal and early postnatal development affects individual susceptibility to various adult-onset chronic diseases. The research team focuses on nutritional influences on developmental epigenetics as a likely mediating mechanism. Epigenetic gene regulatory mechanisms regulate tissue-specific patterns of gene expression that are established during development. CNRC scientists are increasingly interested in whether maternal obesity and nutrition before and during pregnancy affect developmental epigenetics in the hypothalamus and, consequently, body weight regulation in her offspring. Contact Robert Waterland, PhD (waterland@bcm.edu) for more information.

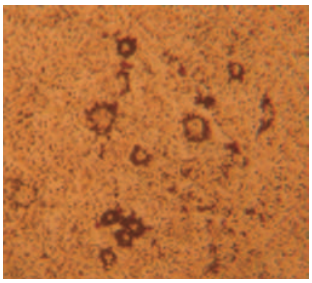


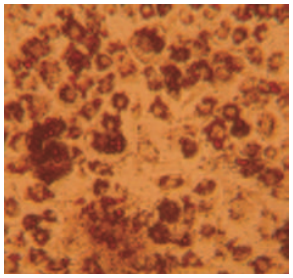


THE FUNCTION OF FAT TISSUE AND OTHER ORGANS ON METABOLIC DISEASES AND AGING

Researchers at the Children!s Nutrition Research Center are studying the function of fat tissue, as well as other metabolic organs, such as muscle, heart, and liver in metabolic diseases and aging. The major approach is to study the molecular mechanism of caloric restriction earlier in the lifespan. Dietary caloric restriction is the only known non-genetic method to extend animal life span. It also reduces the onset of age-related diseases, such as obesity, diabetes, neurodegenerative and cardiovascular diseases and cancer. The study of the molecular mechanism of caloric restriction may lead to pharmaceutical treatments that mimic dietary restriction!s beneficial effects. Contact Qiang Tong, PhD (qtong@bcm.edu) for more information.

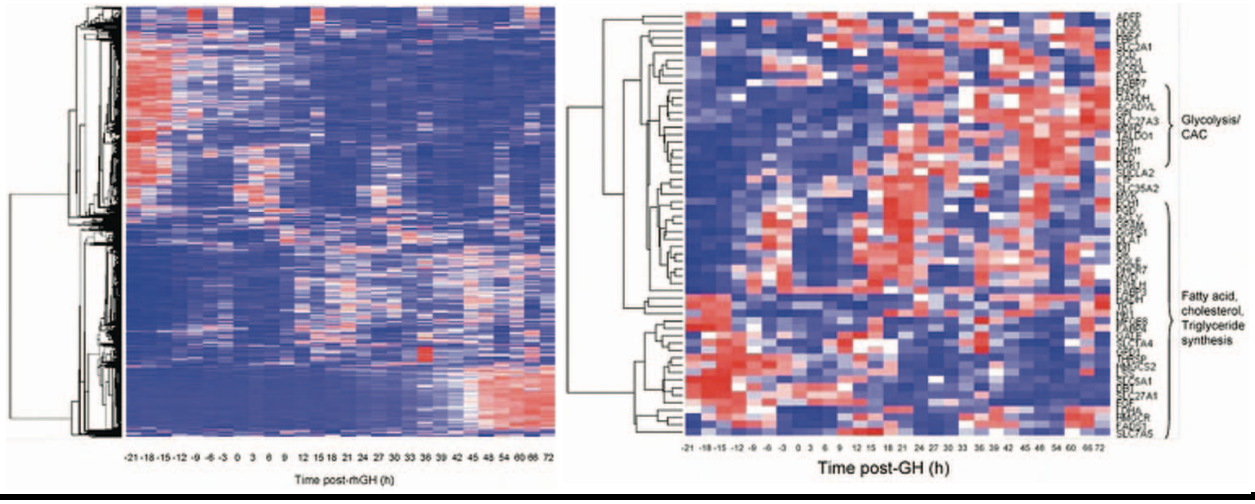






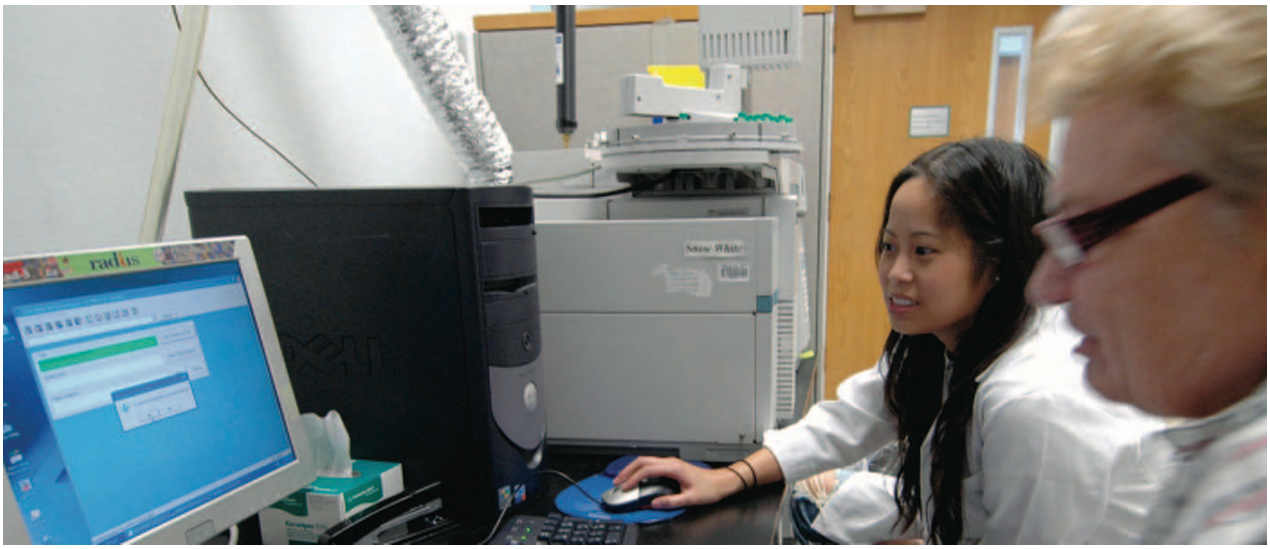
COMPREHENDING CARBOHYDRATE ABSORPTION IN INFANTS AND CHILDREN

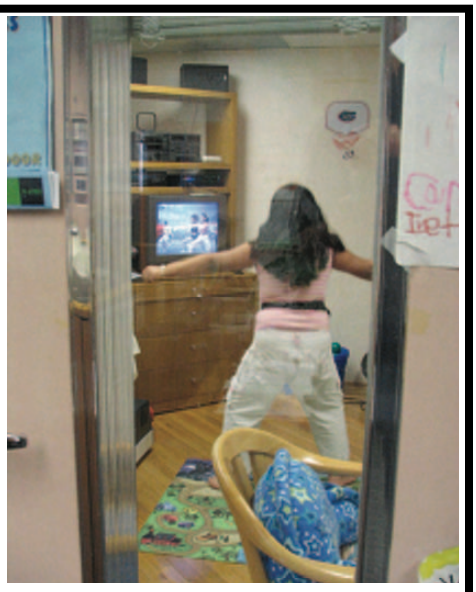
Pediatricians at the Children!s Nutrition Research Center are working to delineate and ultimately manipulate the hormone and substrate factors that regulate the absorption, assimilation, mobilization and disposal of carbohydrates in infants and children. The delicate balance of nutrient availability to meet the energy and growth needs of children are frequently disturbed as a result of chronic disease, infection, trauma and/or organ failure. In addition, the increasing incidence of both type I and type II diabetes provides unique opportunities to study the effects of insulin, insulin resistance and obesity on macronutrient assimilation in children. More recently we have been studying the maternal adaptation to lactation and the hormone, substrate and molecular factors controlling lactation in humans. Contact Morey Haymond, MD (mhaymond@bcm.edu) for more information.

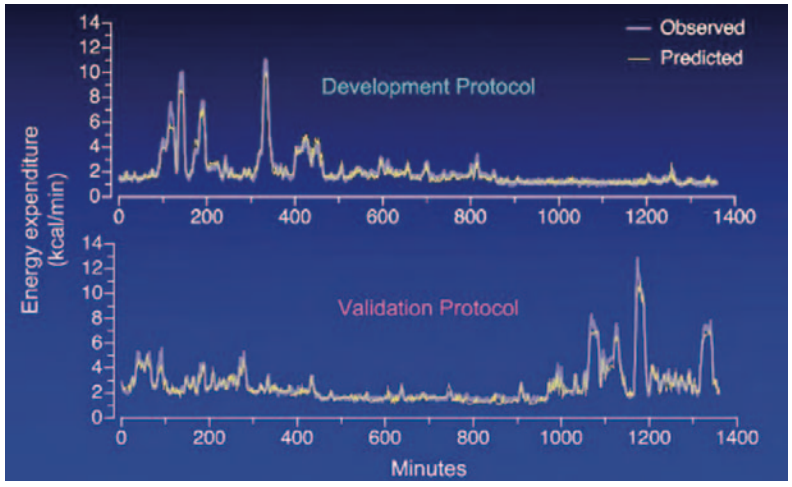


CHILDHOOD UNDERNUTRITION: EARLY TREATMENT AND REHABILITATION

Researchers at the Children!s Nutrition Research Center are studying the metabolic response to severe childhood undernutrition and how to optimize early treatment and rehabilitation. Additional research is being conducted to better understand the impact of undernutrition and suboptimal folate and vitamin B12 nutritional statuses on the metabolic and physiologic adaptations necessary for a successful pregnancy. Contact Farook Jahoor, PhD (fjahoor@bcm.edu) for more information.





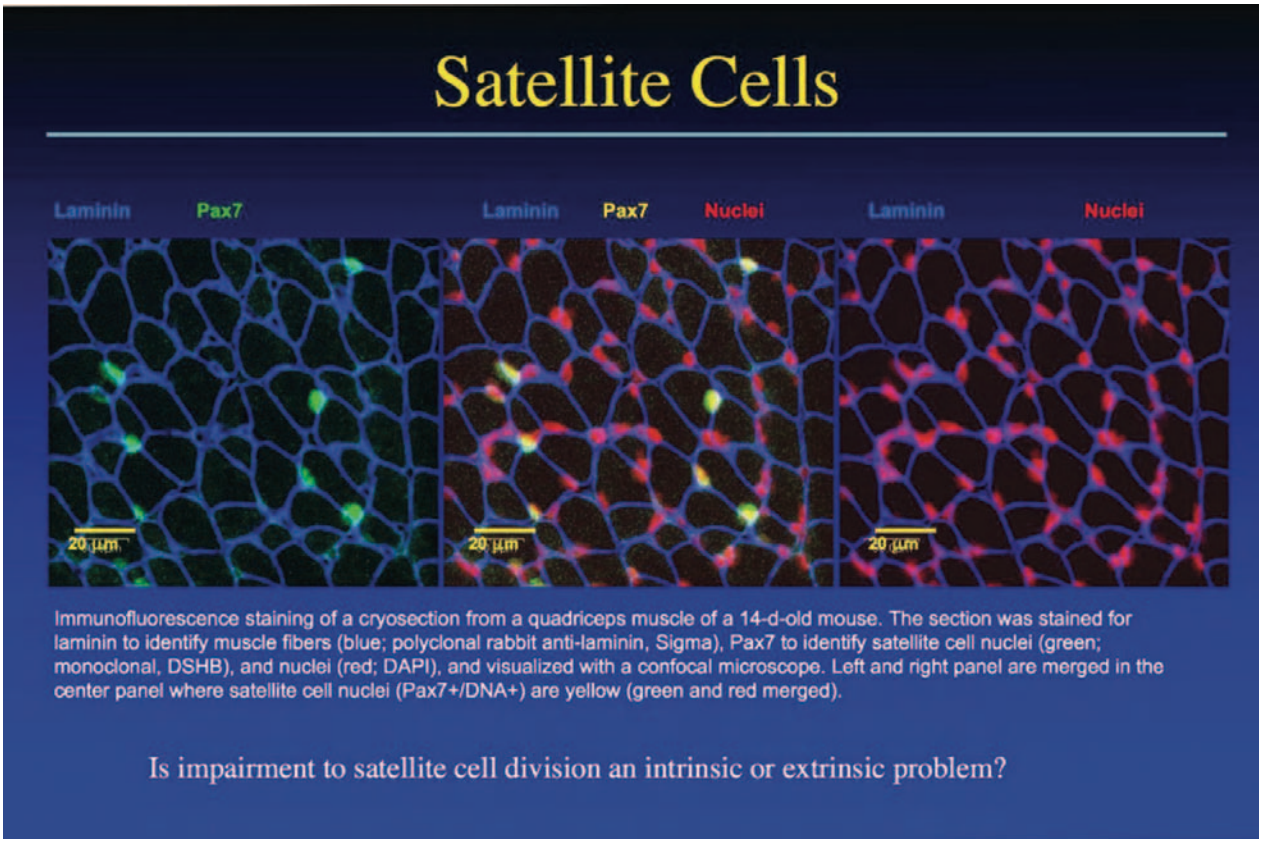


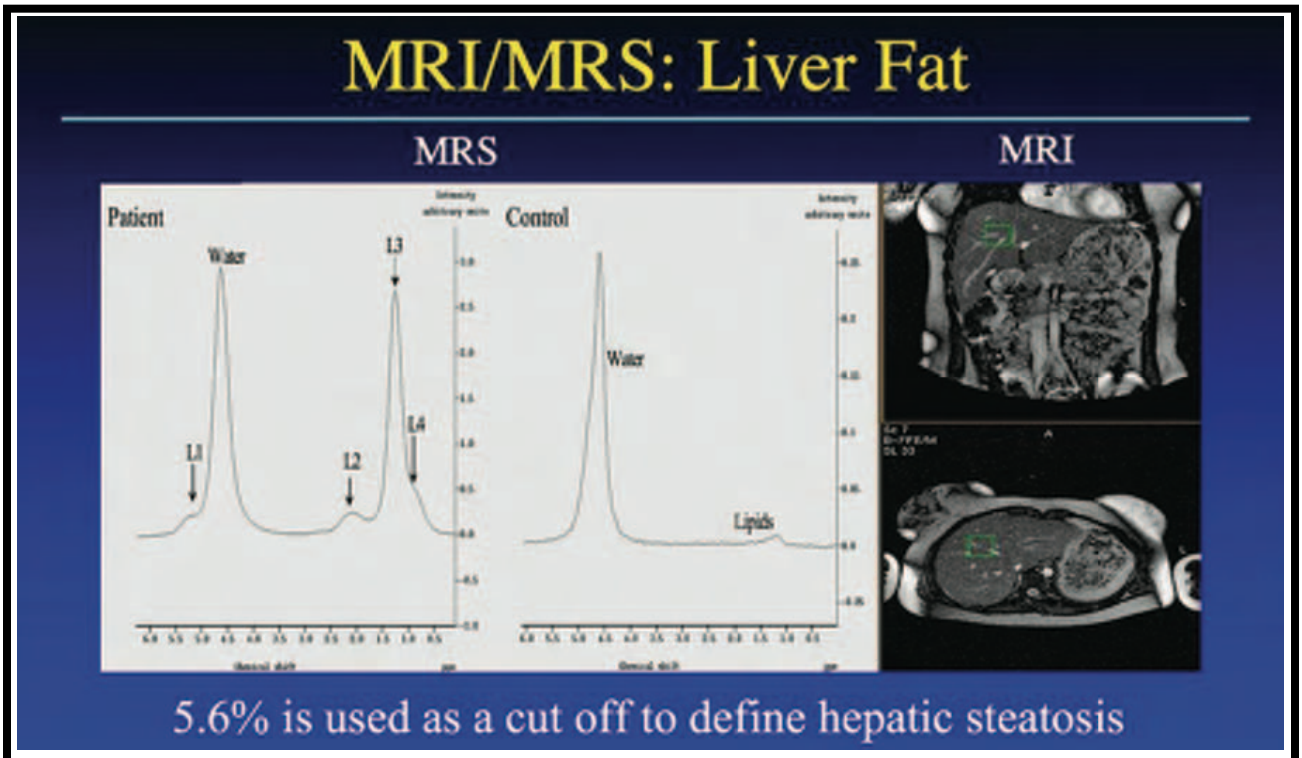
ENVIRONMENTAL AND GENETIC CAUSES OF CHILDHOOD OBESITY

Researchers at the Children!s Nutrition Research Center are focusing their efforts on the environmental and genetic causes of childhood obesity. Understanding the causes of obesity is key to its treatment and prevention. Exhaustive gene sequencing is being performed to identify the genetic variants responsible for the propensity for obesity. Biological factors underlying childhood obesity include measurements of body composition, food intake, eating behavior, energy partitioning during growth, energy expenditure, physical fitness and activity, and hormones and metabolites. CNRC researchers are conducting a family-based intervention at the community level to test the effectiveness of a lifestyle- behavioral modification program for the treatment of childhood obesity. These studies will provide scientists with a greater understanding of the genetic, biological and environmental factors influencing the development of childhood obesity. Contact Nancy Butte, PhD (nbutte@bcm.edu) for more information.

COMPREHENDING THE INFLUENCE OF NEWBORN'S MUSCLE GROWTH RATE ON THEIR ADULT LEAN BODY MASS

Researchers at the Children!s Nutrition Research Center are studying the regulation of muscle growth rate in the newborn period, and how this influences adult lean body mass. Research is underway that aims to identify how the developmental stage of skeletal muscle influences both the short- and the long-term response of the muscle to two of the primary regulators of muscle growth: nutrient availability and endocrine factors. Contact Marta Fiorotto, PhD (martaf@bcm.edu) for more information.



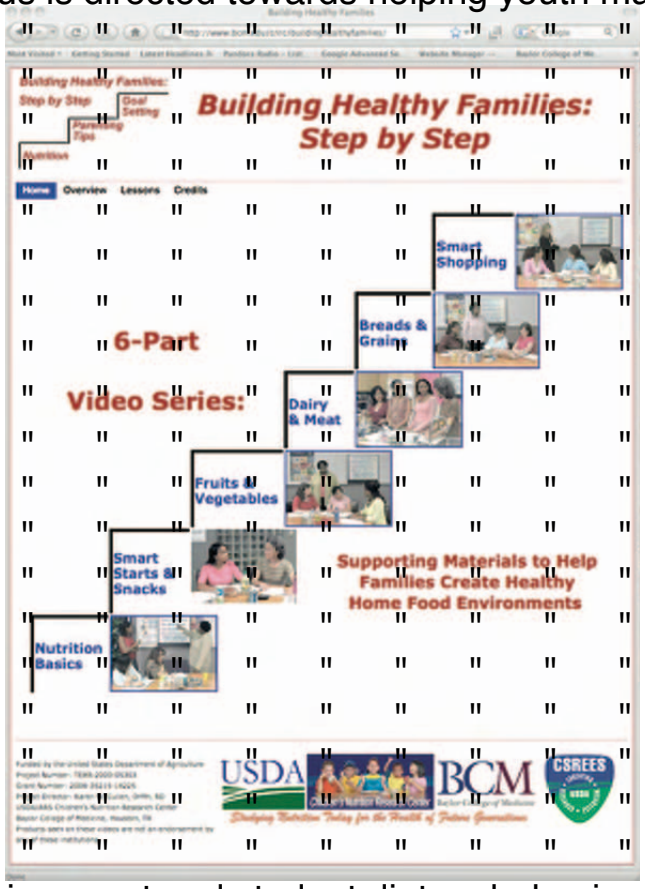


EFFECTS OF DIFFERENT EXERCISE PROGRAMS ON THE PREVENTION AND TREATMENT OF OBESITY RELATED ILLNESSES

A Children's Nutrition Research Center research team is interested in obesity related disturbances in body fat distribution, glucose and lipid metabolism and insulin sensitivity in adolescents. Specifically, the group is investigating the effects of different types of exercise programs on these parameters. The goal is to define strategies that are well accepted efficient in the prevention and treatment of obesity related illnesses. Contact Agneta Sunehag, M.D., PhD (asunehag@bcm.edu) for more information.

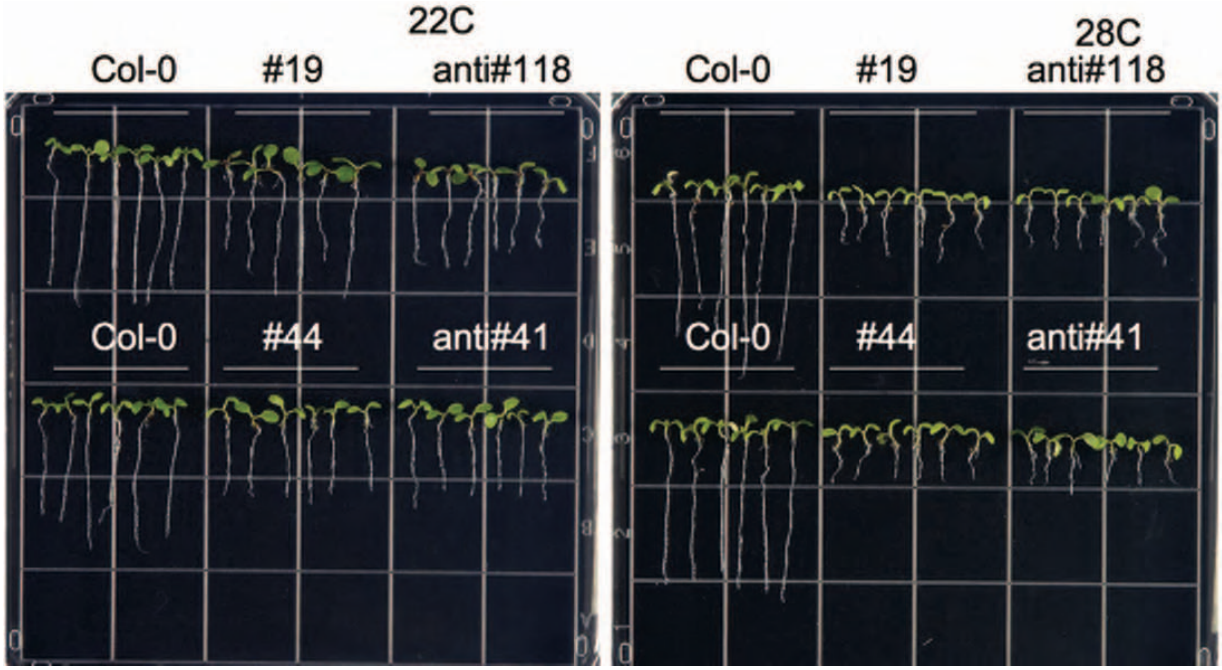
INTERNET-BASED NUTRITION BEHAVIOR CHANGE PROGRAMS FOR TEENS AND AFRICAN-AMERICAN FAMILIES

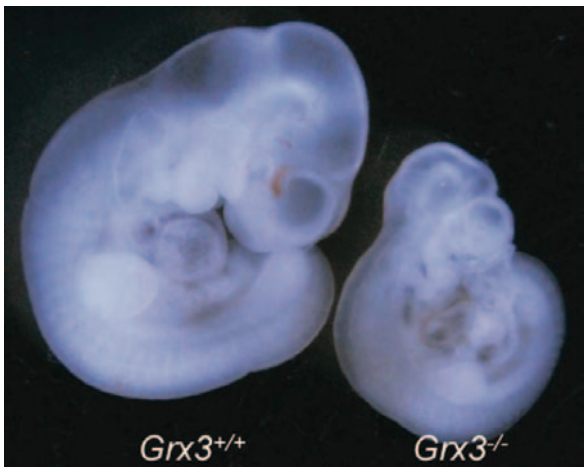
Researchers at the Children!s Nutrition Research Center are interested in the prevention of obesity and diet-related chronic diseases. Their research focus is directed towards helping youth make healthy food and activity choices, promoting healthy school food environments, and enabling families to provide healthy food environments and appropriate parenting about food. Two internet-based nutrition behavior change programs for teens and African-American families are being tested; disseminating materials that complement WIC, the Expanded Food and Nutrition Education Program classes, or other classes for women involved with feeding their families, and evaluating programs designed to improve the school food environment and student dietary behaviors at school. Contact Karen Cullen, DrPH (kcullen@bcm.edu) for more information.

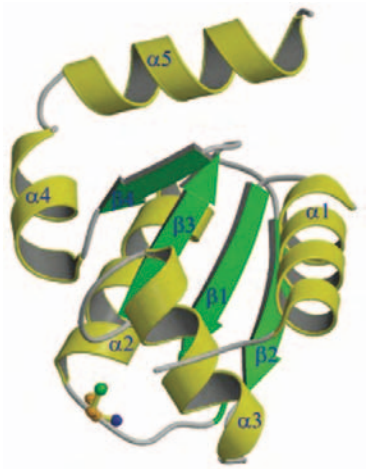


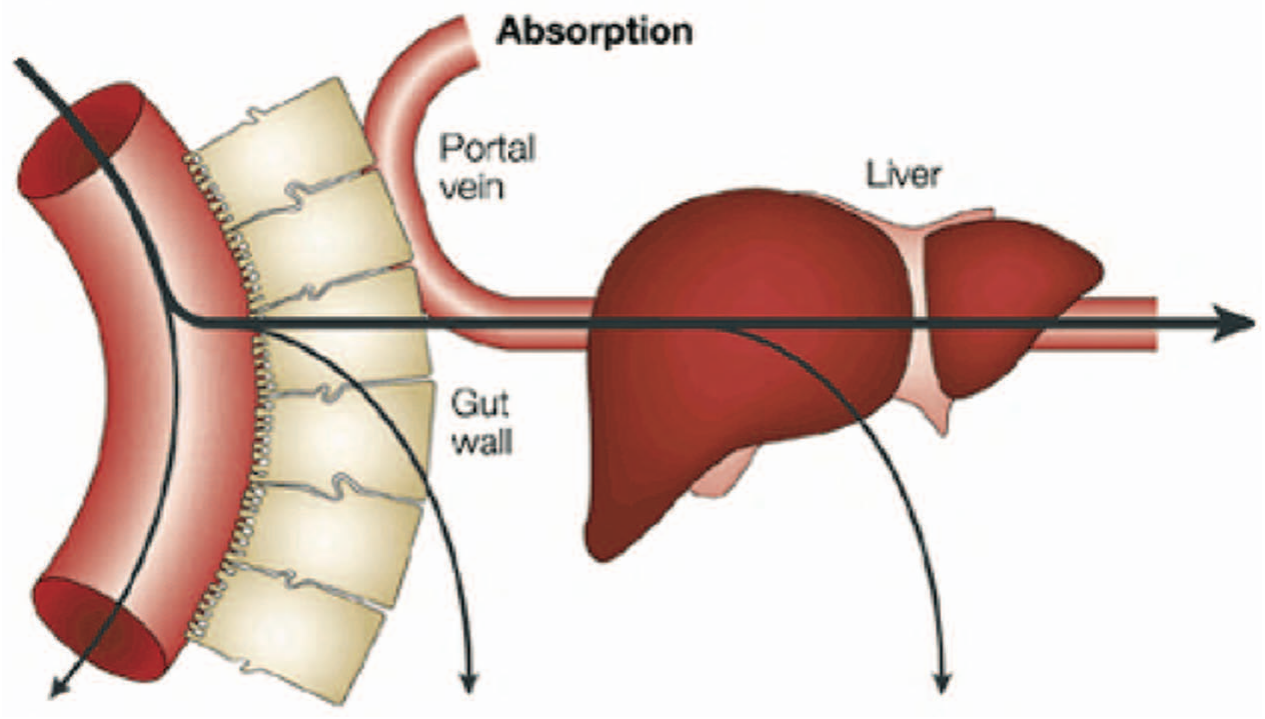
STUDYING THE ROLE OF REDOX REGULATION OF INSULIN AND ITS EFFECTS ON NUTRIENT METABOLISM

Researchers at the Children!s Nutrition Research Center are studying redox regulation of insulin signaling in nutrient metabolism with emphasis on the metabolic disorders including type-2 diabetes and obesity. Redox regulation incorporates mechanisms to modulate gene expression and protein levels. It will be important to understand the mechanistic link between Grx-mediated redox signals and insulin signaling pathways and the biochemical nature of those processes. As an initial step towards this goal, researchers are currently investigating a novel group of Grxs-monothiol Grxs, which were recently identified and isolated from bacteria, fungi, plants, and animals including mammals. Contact Ning-Hui Cheng, PhD (ncheng@bcm.edu) for more information.



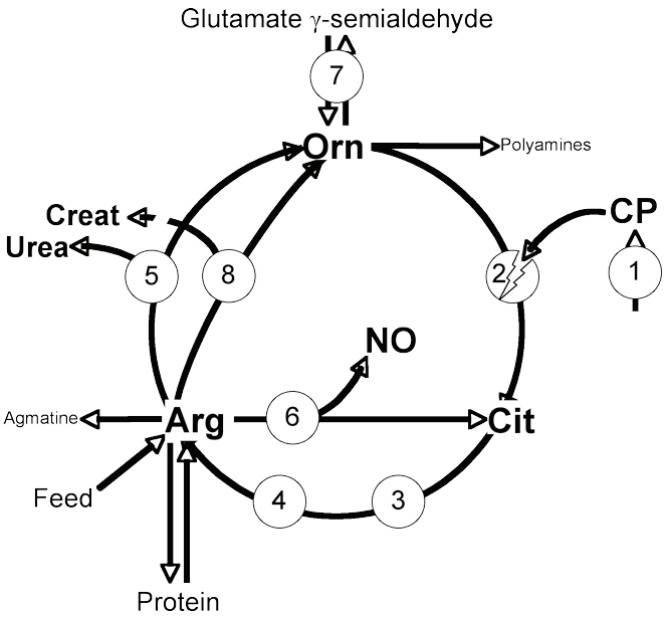






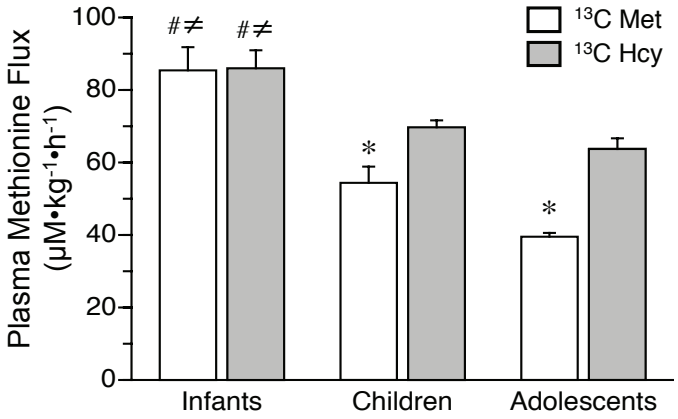
NUTRITIONAL ASPECTS OF UREA CYCLE AND ARGININE METABOLISM

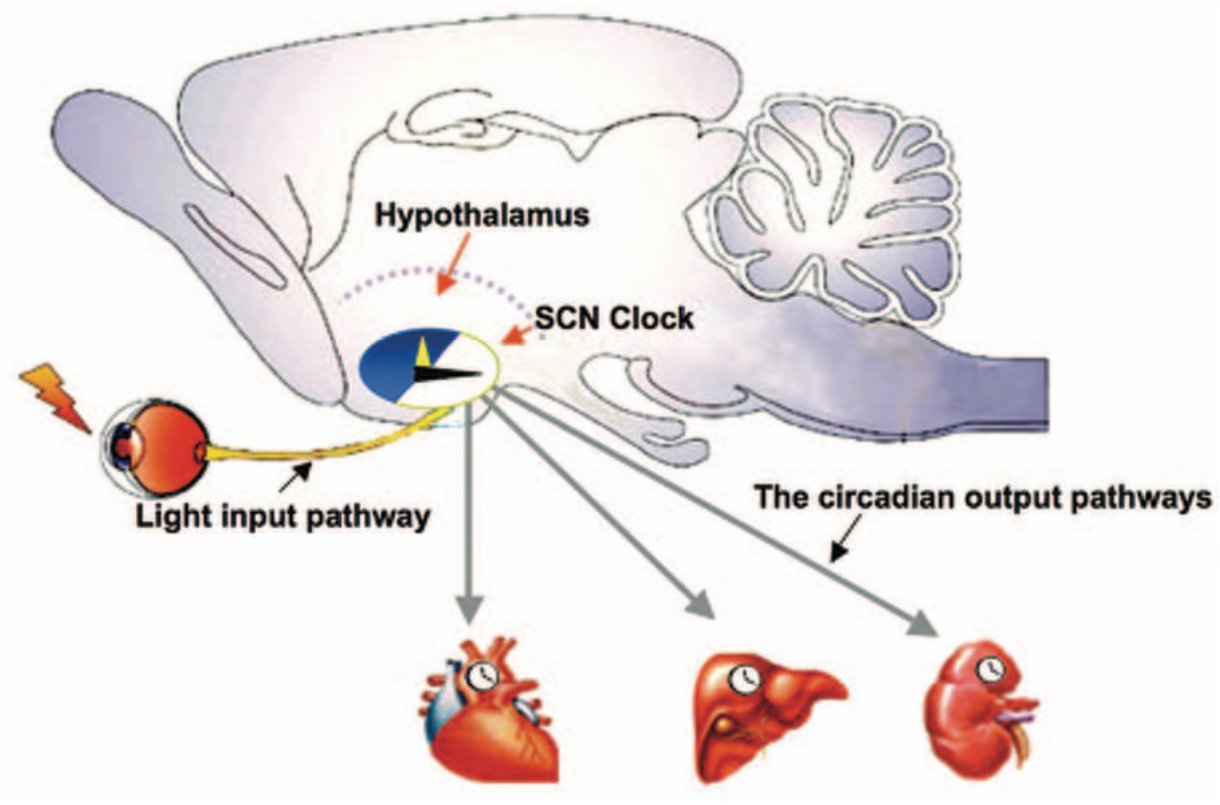
Researchers at the Children!s Nutrition Research Center are focused on the nutritional aspects of urea cycle and arginine metabolism. Studies are aimed at increasing our understanding of how the supply of urea cycle intermediates help overcome reduced enzymatic activity found in urea cycle disorder models and how a reduced arginine availability impacts nitric oxide production. Contact Juan Marini, DVM, PhD (marini@bcm.edu) for more information.



AMINO ACID FUNCTION AND METABOLISM IN CRITICALLY ILL AND HEALTHY CHILDREN

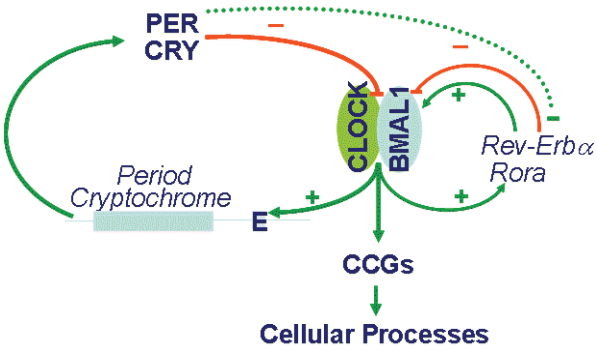
Scientists at the Children!s Nutrition Research Center are focused on the investigation of amino acid function and metabolism in critically ill and healthy children. Limited information exists on amino acid requirements that adequately support nutritional balance and function in healthy or critically ill children. These studies are of critical importance as excessive or deficient amounts can be harmful and contribute to early stages of certain diseases. Contact Leticia Castillo, M.D. (lcastill@bcm.edu) for more information.





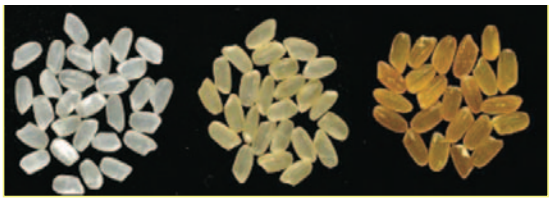
CELL GROWTH AS IMPACTED BY THE CIRCADIAN CLOCK

Circadian rhythms are daily repetitions of various physiological processes that are driven by an “internal time clock”, the circadian clock. Researchers at the Children!s Nutrition Research Center are using mice as models to study the mechanism of the circadian rhythm in cell growth and DNA-damage response. Molecular, cellular, and genetic approaches are used to study how the circadian rhythm impacts cell growth. Contact Loning Fu (loningf@bcm.edu) for more information.



COMPREHENDING THE REGULATION OF PLANT NUTRIENT TRANSPORT TO ENHANCE PLANT NUTRITION

CNRC scientists are studying the mechanisms and regulation of nutrient transport in plants with the goal of using this knowledge to enhance the nutritional quality of plant foods for human consumption and to label plants with stable isotopes for use in human studies to measure nutrient bioavailability. Studies are conducted with various seed crops such as rice, wheat, maize, soybean, bean, pea, and chickpea; with vegetable crops, such as tomato, spinach, lettuce, and collards; and on various plant models. Contact Michael Grusak, PhD (mike.grusak@ars.usda.gov or mgrusak@bcm.edu) for more information.



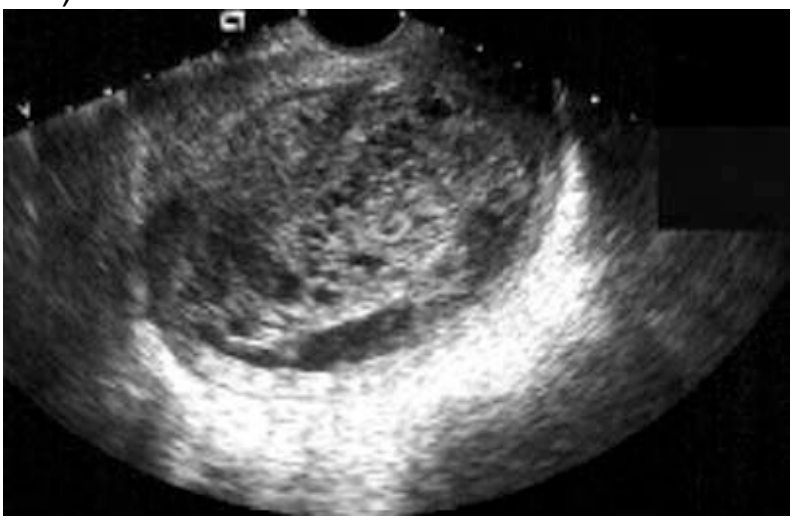
Conv. Rice
0 µg/g DW

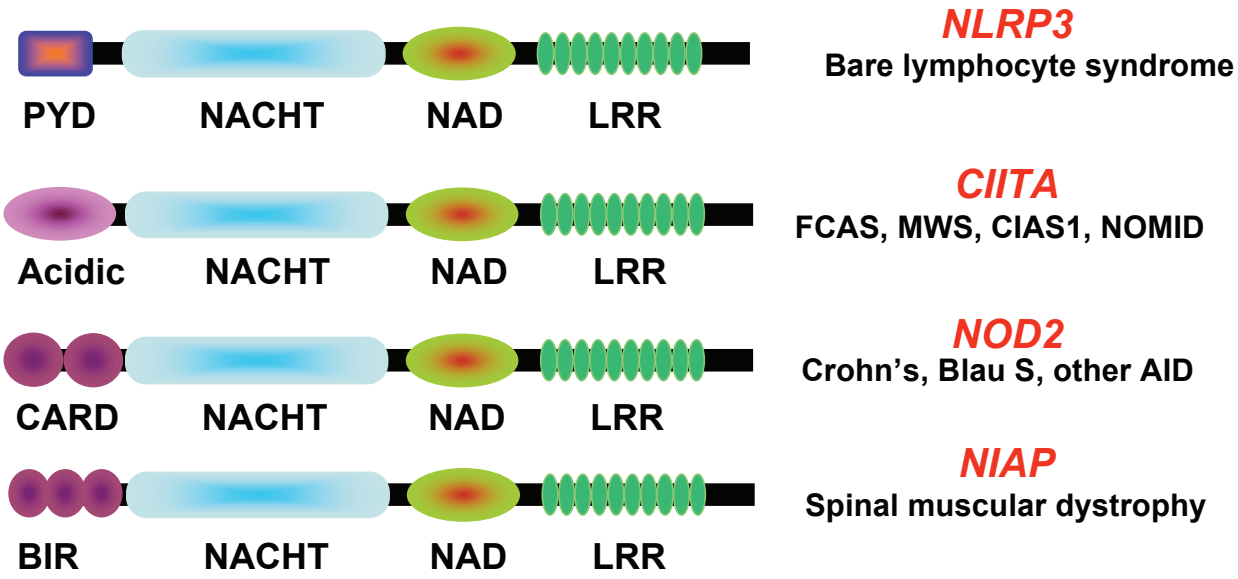
Golden Rice 1
1.6 µg/g DW
0.8 µg β-C/g

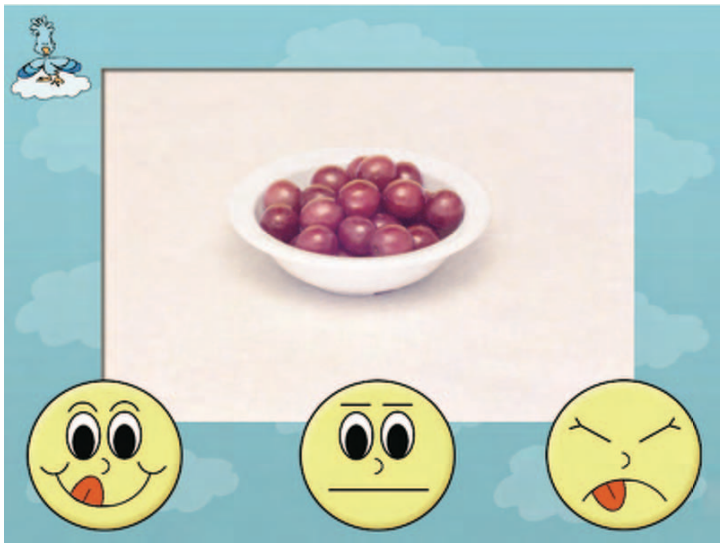
Golden Rice 2
37 µg/g DW
30 µg β-C/g

DNA METHYLATION DURING EARLY DEVELOPMENT AND ITS IMPACT ON ADULT HEALTH AND DISEASE

Researchers at the Children!s Nutrition Research Center are attempting to determine if DNA methylation (a chemical modification of DNA) is important for regulating gene expression during early development, and how altered DNA methylation at this stage impacts adult health and disease. Researchers have shown that DNA methylation can be influenced by enriched diets, containing substances such as folic acid and betaine, and are investigating the most optimal dietary composition to see this effect. They are also studying the effect of diets with different protein content on these processes. This study may provide insight into the developmental origins of adult disorders, but may also provide a better understanding for the role diet may play in prenatal-onset disorders and birth defects (e.g. neural tube defects). Contact Ignatia Van den Veyver, M.D. (iveyver@bcm.edu) for more information.

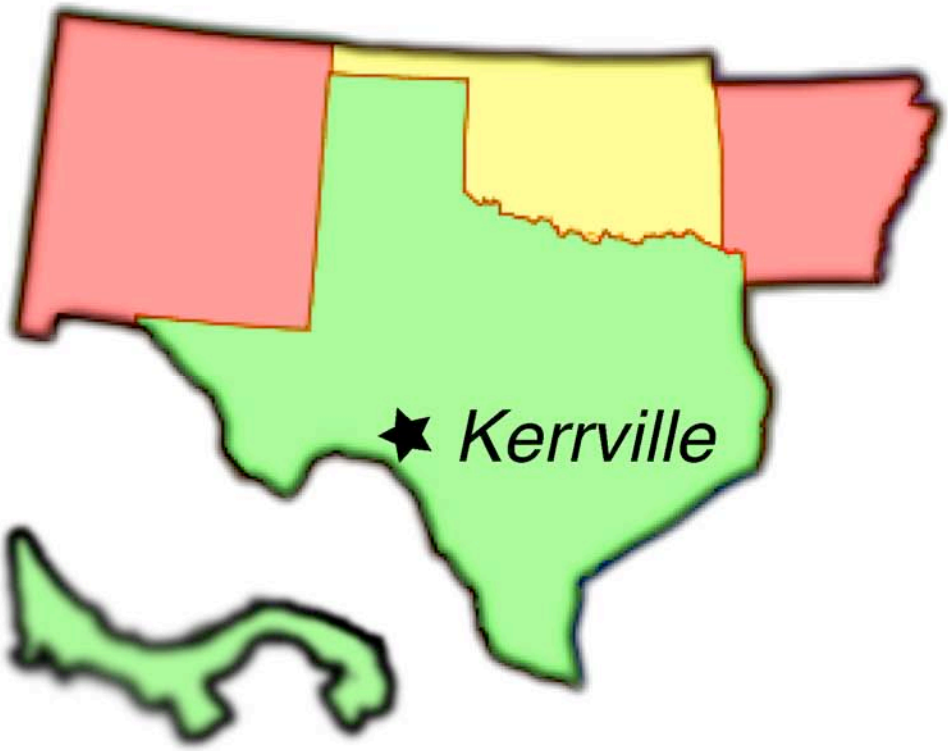






UNDERSTANDING FACTORS THAT MEDIATE CHRONIC DISEASE RISK

Children!s Nutrition Research Center scientists are studying both the epidemiological and intervention aspects of chronic disease prevention and health promotion. Before an intervention can effectively prevent chronic disease risk, the factors that mediate one's risk need to be understood. Current areas of research include a detailed investigation of the relationship between eating patterns, diet quality, and obesity in children and young adults; an examination of environmental influences on eating patterns and weight of Head Start preschool children; evaluation of a physical activity intervention for preschool children; a valid and reliable method for collecting dietary intake data on young children via digital photography; the evaluation of fruit and vegetable commercials that impact children!s preferences and consumption of fruit and vegetables; and the examination of predictors of children!s serving sizes and mealtime intake. Contact Theresa Nicklas, DrPH (tnicklas@bcm.edu) for additional information.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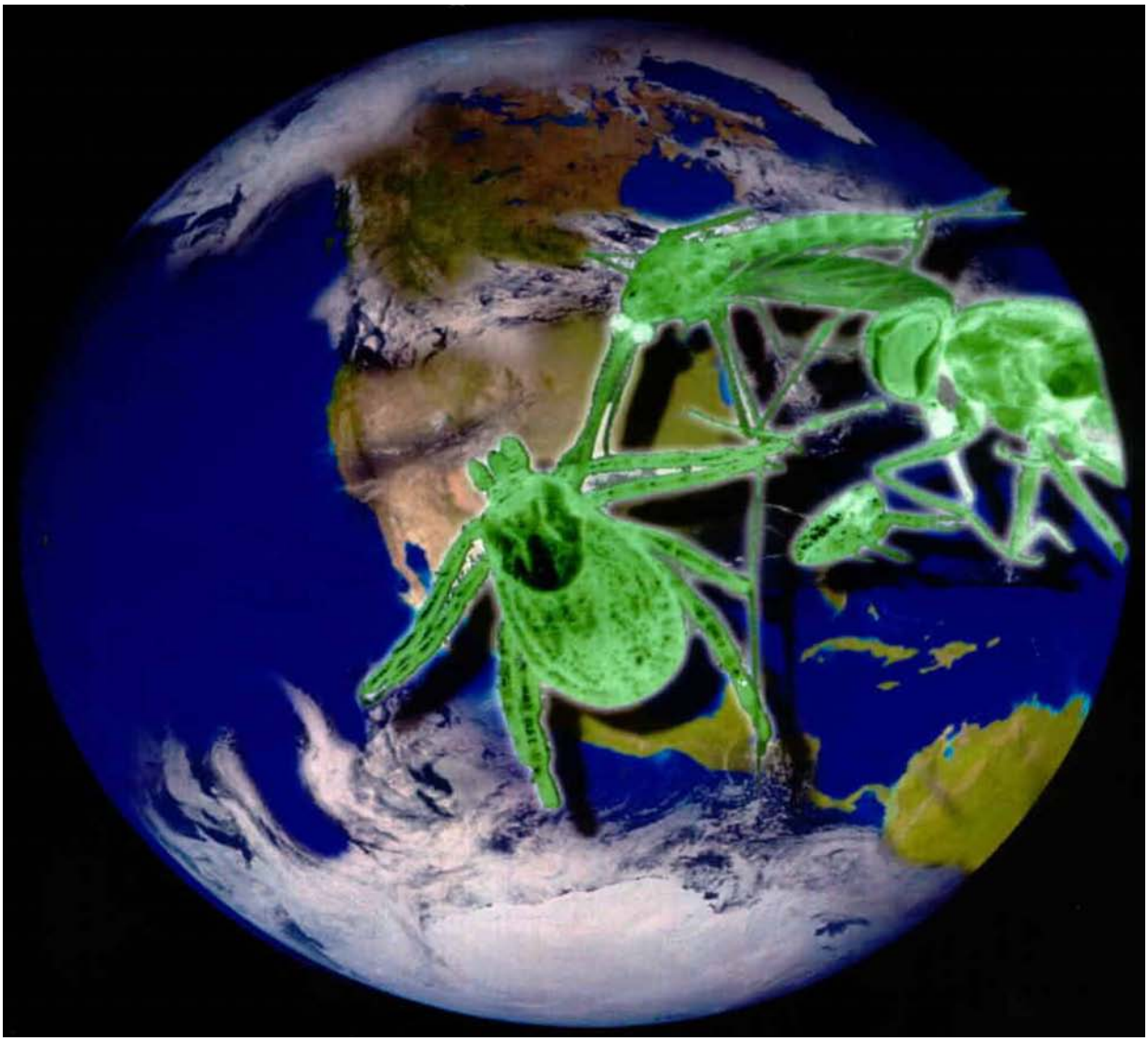
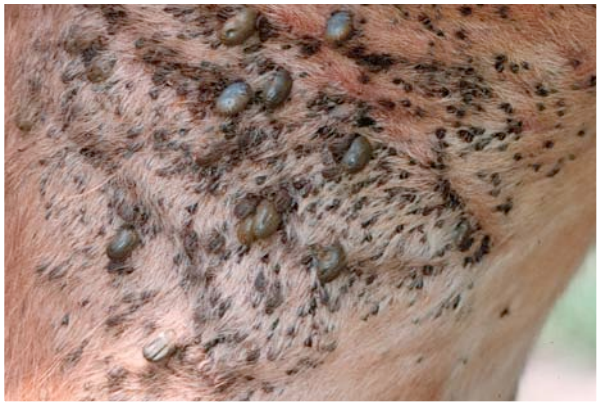


HOST-ECTOPARASITE DYNAMICS & DISEASE TRANSMISSION

Researchers at the KBUSLIRL evaluate the factors ticks and biting flies evolved to be able to parasitize and blood feed on their animal and human hosts. Their studies involve basic and applied research on the molecules of external parasites that play an active role at the host-parasite interface. The research has shown that bioactive molecules can facilitate the infection process by the disease-causing agents ticks and biting flies transmit. Regulatory agencies have used the information generated from our studies to adapt guidance aimed at mitigating the impact of external parasites and the diseases they transmit. Additionally, knowledge from our research can serve as the basis for novel strategies to control ticks and biting flies. Contact Dr. Adalberto Pérez de León (beto.perezdeleon@ars.usda.gov) for additional information.

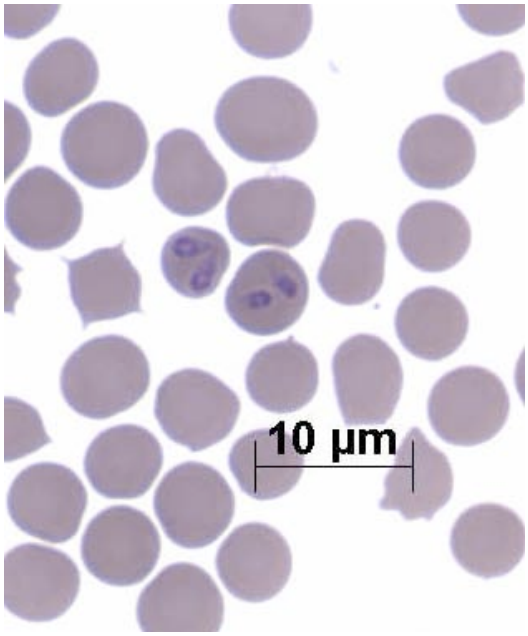
NEW PESTICIDE SYNERGIST TECHNOLOGY DEVELOPED

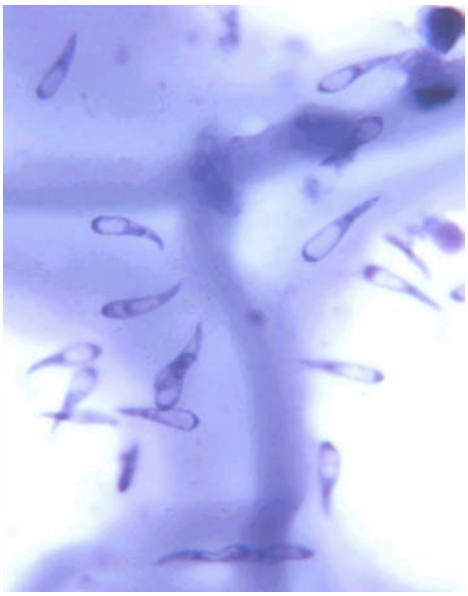
Research at the KBUSLIRL led to the discovery of a group of synergist compounds that can enhance the toxicity of certain organophosphate pesticides against ticks and biting flies. The USDA ARS holds a patent on this technology. New products are being developed through CRADA. Contact Dr. Andrew Y. Li (andrew.li@ars.usda.gov) for additional information.



MINING GENOMES TO CONTROL CATTLE PARASITES

The horn fly, New World screwworm, and cattle tick are serious pests of cattle causing significant economic losses to cattle producers worldwide. Information encoded in the genome of these pests are rich untapped sources of potential targets for the development of novel pesticides or anti-tick vaccines. Additionally, natural populations of these pests contain gene variants which confer pesticide resistance and pesticide exposure selects for these variants, resulting in resistant populations. Studying the complex genomes of these parasites with molecular biological approaches is a promising route to the next generation of effective, arthropod-specific, environmentally friendly control methodologies. Contact Dr. Felix Guerrero (felix.guerrero@ars.usda.gov) for further information.



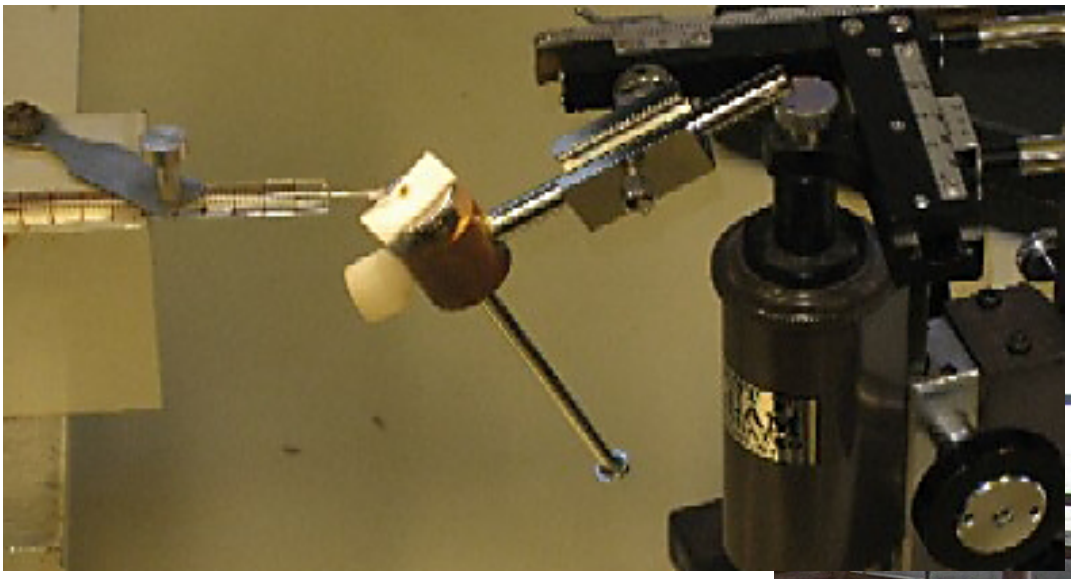


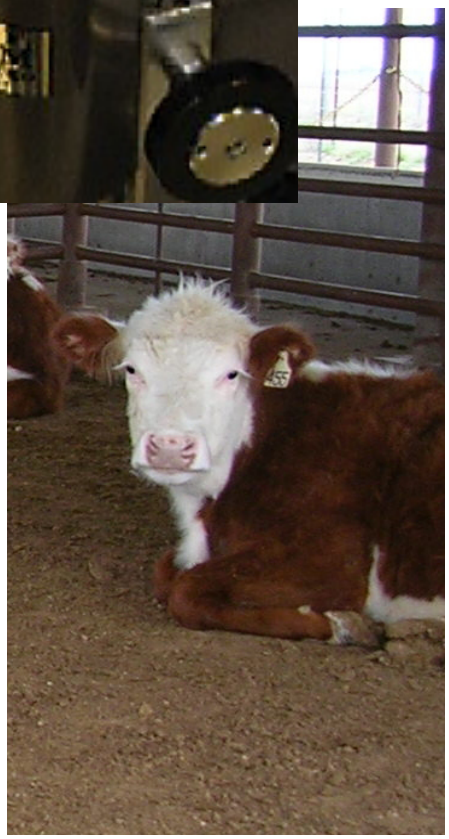
INTERACTIONS BETWEEN CATTLE FEVER TICKS, DEER, AND BABESIA

Researchers at KBUSLIRL are studying the complex interaction between cattle fever ticks, the vectors of the deadly protozoan parasite of cattle Babesia bovis, and white-tailed deer. This research will help clarify the role of deer in the maintenance of ticks and dissemination of this parasite. Contact Dr. Jeanne Howell (jeanne.howell@ars.usda.gov) for more information.

TURNING OFF GENES IN LIVESTOCK PARASITES

The Southern cattle tick is a vector of two fatal cattle diseases. This tick has been eradicated in the U. S., but is still widespread in Mexico. Mexican strains have become resistant to current pesticides, prompting concerns about reinfestation in the United States. In an effort to develop novel control strategies, interfering RNA (RNAi) is used to selectively turn off target genes. RNAi is injected into ticks using microsyringes. Silencing of the target gene is determined by quantitative PCR, and the subsequent feeding, development, and reproduction are monitored to determine the effects of this silencing. Contact Dr. Kevin Temeyer (kevin.temeyer@ars.usda.gov) for further information.

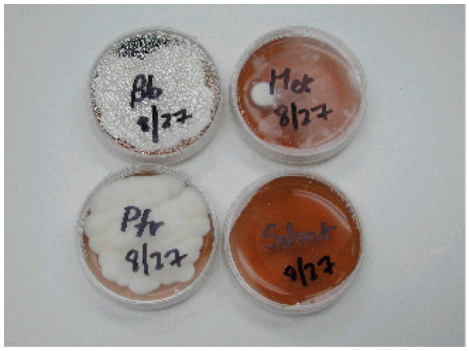




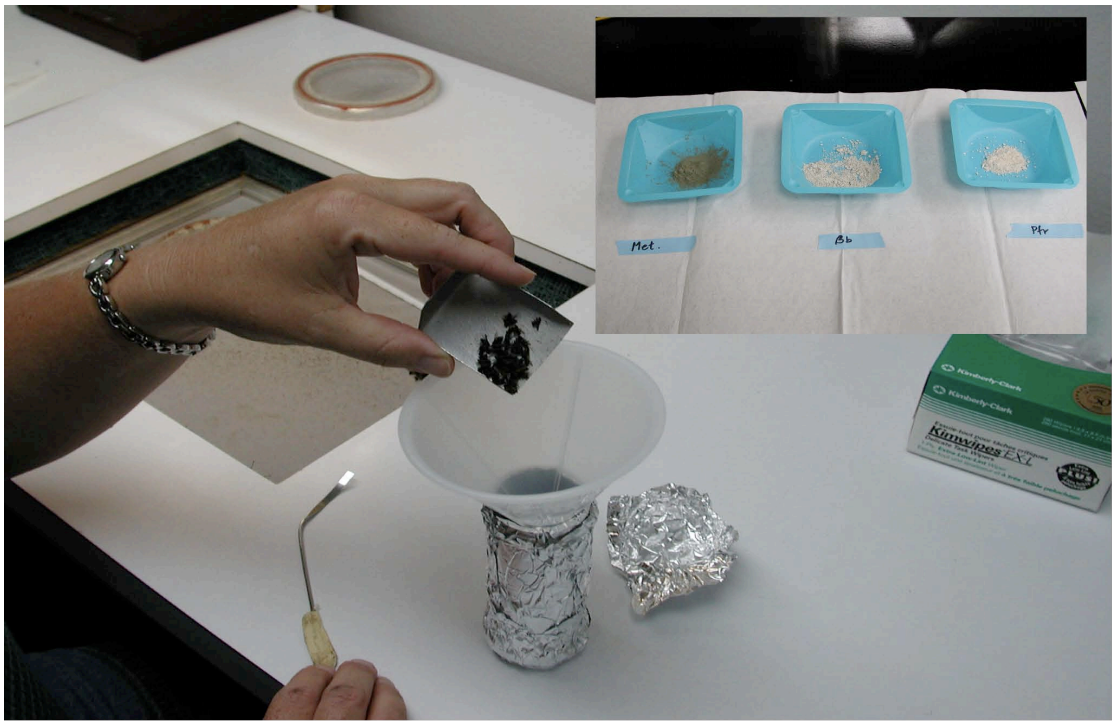
TECHNOLOGY TRANSFERRED: SELF-TREATMENT BAIT STATIONS AND FEEDER ADAPTERS TO CONTROL DISEASE-CARRYING TICKS FEEDING ON WHITE-TAILED DEER

White-tailed deer are the major hosts for ticks that transmit disease agents to humans and livestock. KBUSLIRL scientists developed technologies that reduce tick bites and the incidence of these diseases by killing ticks on white-tailed deer. ARS-patented '4-Poster' Bait Stations and '2-Poster' Feeder Adapters are environmentally friendly devices that apply pesticide to deer that kills ticks thus keeping tick populations at low levels without using area-wide sprays. Contact Dr. Mat Pound (mat.pound@ars.usda.gov) for additional information.

GOOD FUNGI HELP FIGHT



Researchers at KBUSLIRL have evaluated the efficacy of strains of entomopathogenic fungi for controlling biting fly pests of cattle. As a result of this effort, two strains of fungi have been identified as potential alternatives for traditional insecticide control tactics. Contact Dr. Kimberly H. Lohmeyer (kim.lohmeyer@ars.usda.gov) for additional information.

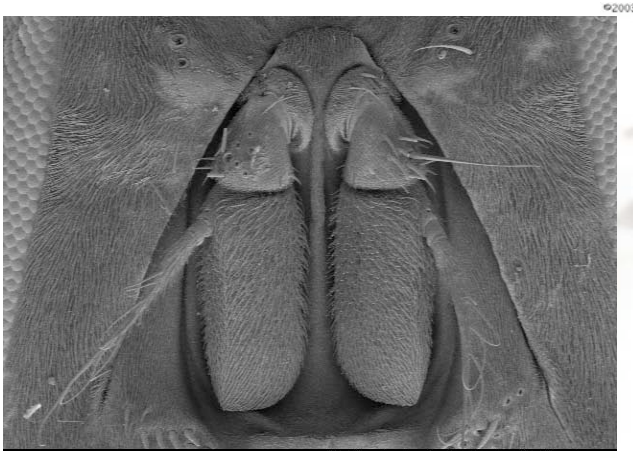


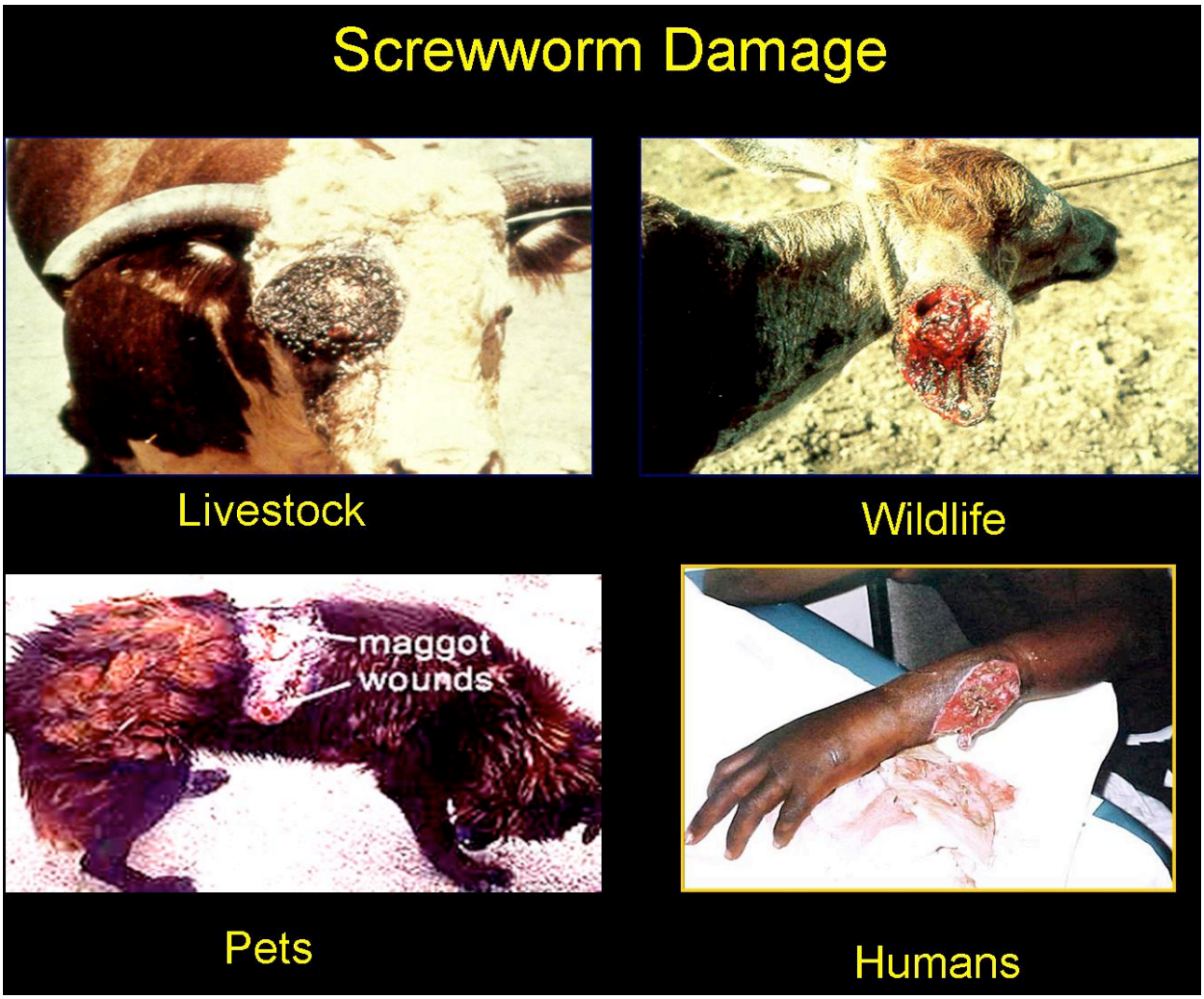
EFFICACY AND RESISTANCE TESTING OF ACARICIDES

Research at the Cattle Fever Tick Research Laboratory is conducted to support the on-going USDA, APHIS, VS, Cattle Fever Tick Eradication Program. We are evaluating alternative acaricides to the use of the organophosphate, coumaphos, which is presently the only approved acaricide used in the program. Studies have centered on the use of a class of chemicals called endectocides, which include ivermectin, doramectin, and moxidectin because these chemicals are presently the only class of acaricidal agents to which the ticks have not shown any resistance. Detailed studies have shown these acaricides to be highly effective at very low dosages. Investigations indicate that the injectable formulations of these agents are considerably more effective than pour-on formulations. Although doramectin has been the frontrunner of these materials because of its longer residual activity, the recent development of long-acting injectable formulations may enhance the potential of several of the endectocides. Acaricide resistance to the major classes of chemicals used to control cattle fever ticks is widespread in Mexico, thus another critical area of research is associated with the characterization of the mechanisms that confer resistance to the ticks. Contact Dr. Ronald Davey (ronald.davey@ars.usda.gov) for additional information.

DEVELOPMENT OF STABLE FLY GENOMIC RESOURCES

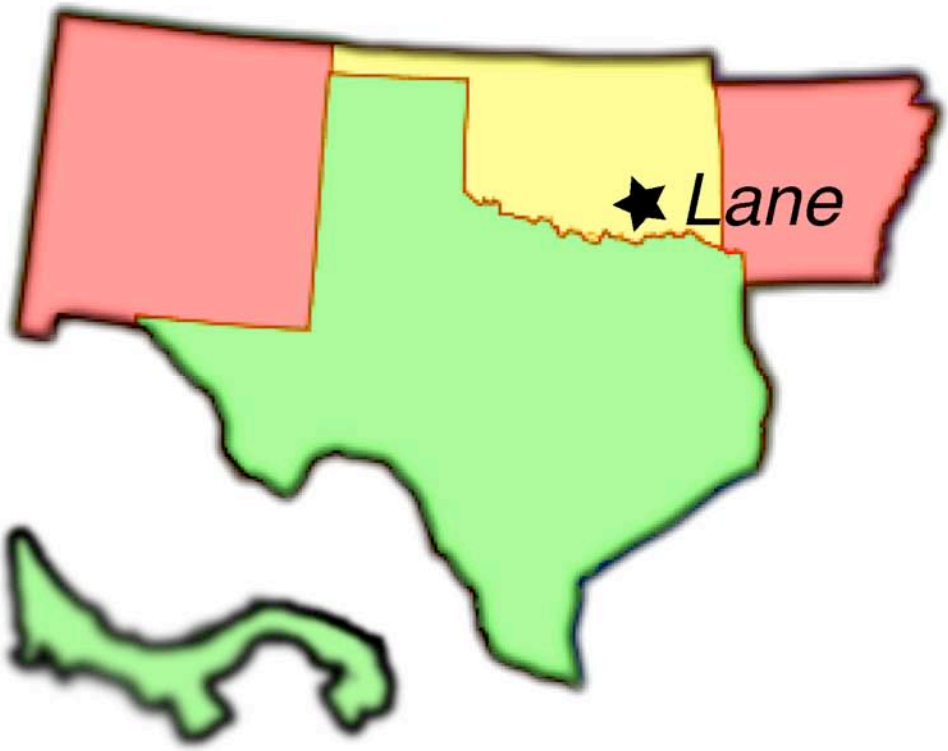
Scientists at the Knipling-Bushland U.S. Livestock Insects Research Laboratory are identifying genes that have a role in stable fly olfaction and are assembling genetic resources in support of a stable fly genome sequencing project. Together, these will enable identification of targets to develop alternative control methods for the stable fly, a significant pest of livestock in the United States. Contact Dr. Pia Untalan Olafson (pia.olafson@ars.usda.gov) for additional information.





SCREWWORMS CAUSE EXTREME DAMAGE TO LIVESTOCK, WILDLIFE, PETS AND HUMANS

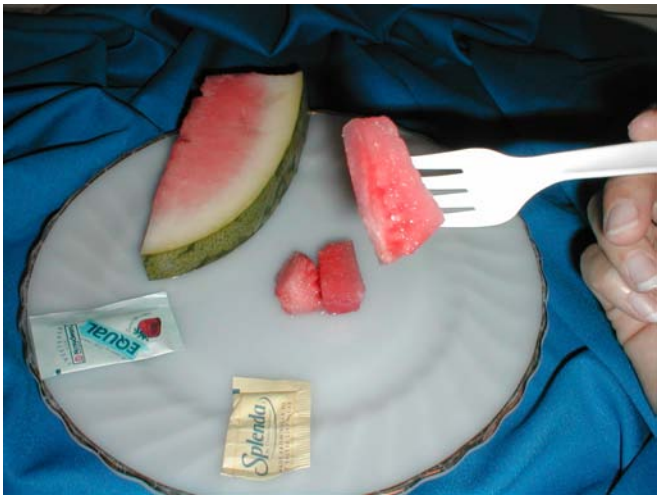
The Screwworm Research Unit provides basic and applied research needed by action agencies to eradicate screwworms and to protect against reinfestation by: 1) applying quantitative procedures to characterize screwworm ecology in areas of future eradication efforts: 2) assessing current technology in remote sensing applicable to the prediction of screwworm distribution; 3) developing new sterile male release strategies for use in the barrier zone and outbreak areas; 4) guiding development and evaluation of new screwworm strains for large-scale production and use in the eradication program; 5) improving screwworm diet and rearing technology; and 6) characterizing population genetics of screwworms, genetic changes during colonization in the production facility and working to develop a genetic sexing strain for improved mass production of screwworms. Contact Dr. Steven Skoda (skodas@sl.edu) for additional information.


Lane

GENETICS PROVIDE DISEASE CONTROL AND LOWER SUGAR WATERMELON

Scientists at the South Central Agricultural Research Center in Lane, OK are examining powdery mildew, an evolving disease on watermelon occurring in production areas in the U.S. It is difficult to control and impacts yield and fruit quality. Watermelon lines were screened for resistance. Selection of the most resistant plants developed a watermelon line resistant to race 1 powdery mildew was derived from U.S. Plant Introduction (PI) 525088.

Conventional breeding has increased immediately-available sugar content in watermelon limiting serving size for those concerned about dietary sugar intake. Three lines developed produce crisp red-fleshed water-melon with a sugar content of 5 to 9% containing amounts of lycopene equivalent to normal watermelon. Adding non-sugar sweetener makes lines as acceptable as the full-sugar control. Contact Dr. Angela Davis (angela.davis@ars.usda.gov) for additional information.



PRODUCTIONS SYSTEMS: PUTTING THE PIECES TOGETHER

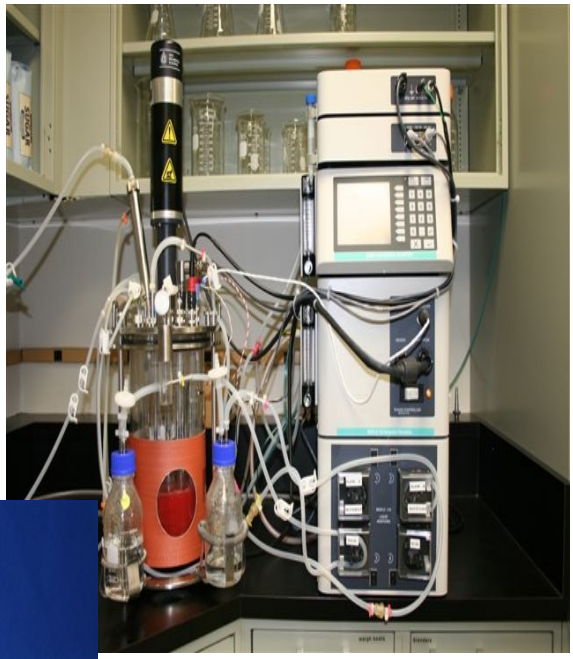
Researchers at the South Central Agricultural Laboratory, Lane, OK, are examining components of production and integrating them into production systems. The goal is to develop sustainable systems using appropriate techniques and inputs to insure continued acceptable yields for vegetable and other crops that will be useful for all producers, especially those with small and medium size operations. Contact Dr. Vincent Russo (vincent.russo@ars.usda.gov) for additional information.

ORGANIC WEED CONTROL IN VEGETABLE CROPS

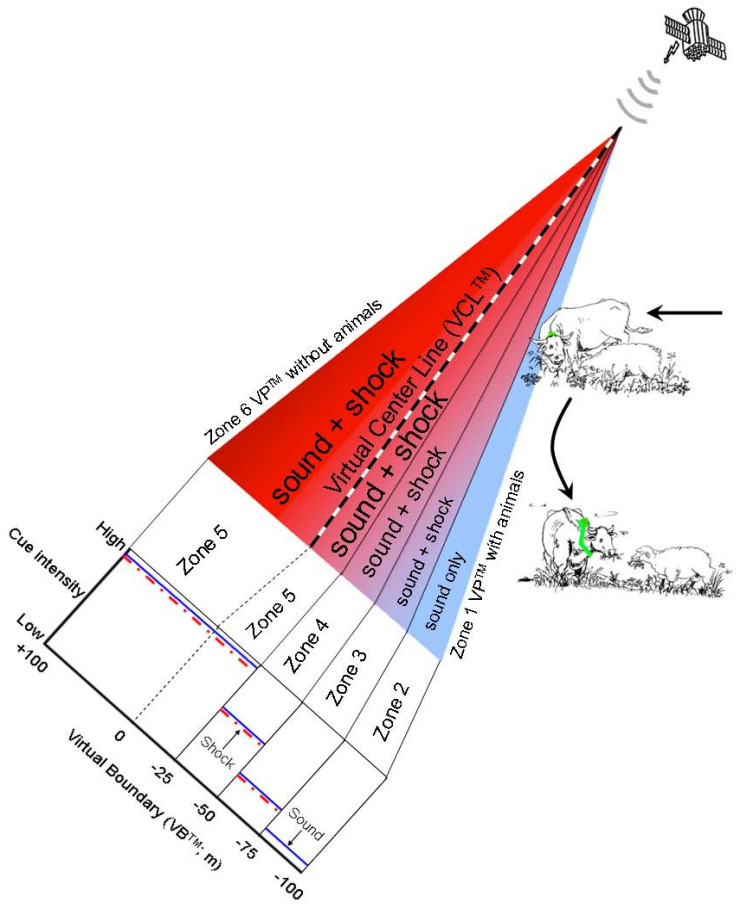
Research at the South Central Agricultural Research Laboratory determined the effectiveness of approved and potential organic herbicides in vegetable crops and impact of application rate, method, and timing. The herbicides were more effective controlling broadleaf weeds compared to grasses, annual weeds compared to perennial weeds, small and immature weeds compared to larger and more mature weeds. Contact Dr. Charles Webber (chuck.webber@ars.usda.gov) for additional information.

WATERMELON: A REFRESHING TREAT AND BEYOND!

About 20 percent of the nation's watermelons left in the field each year represent an addition to America's portfolio of diverse biofuel crops. In addition to developing integrated processes for obtaining the valuable neutraceutical compounds lycopene and L-citrulline from watermelon, the research at the South Central Agricultural Research Laboratory at Lane, OK, demonstrates that ethanol can be produced from sugars in the processing waste-stream juices. Each 20,000 pounds of watermelon will yield about 0.5 pound of lycopene, 40 pounds of L-citrulline, and 120 gal of ethanol that can be used as a biofuel. Making ethanol offers the potential benefits of helping to defray sewage treatment costs of neutraceuticals production and providing growers with a new market. SCARL scientists are also developing an inter-cropping system, whereby other ethanol crops like sweet sorghum and annual ryegrass could be rotated with watermelon, providing a year-round source of ethanol. Contact Dr. Wayne Fish (wayne.fish@ars.usda.gov).

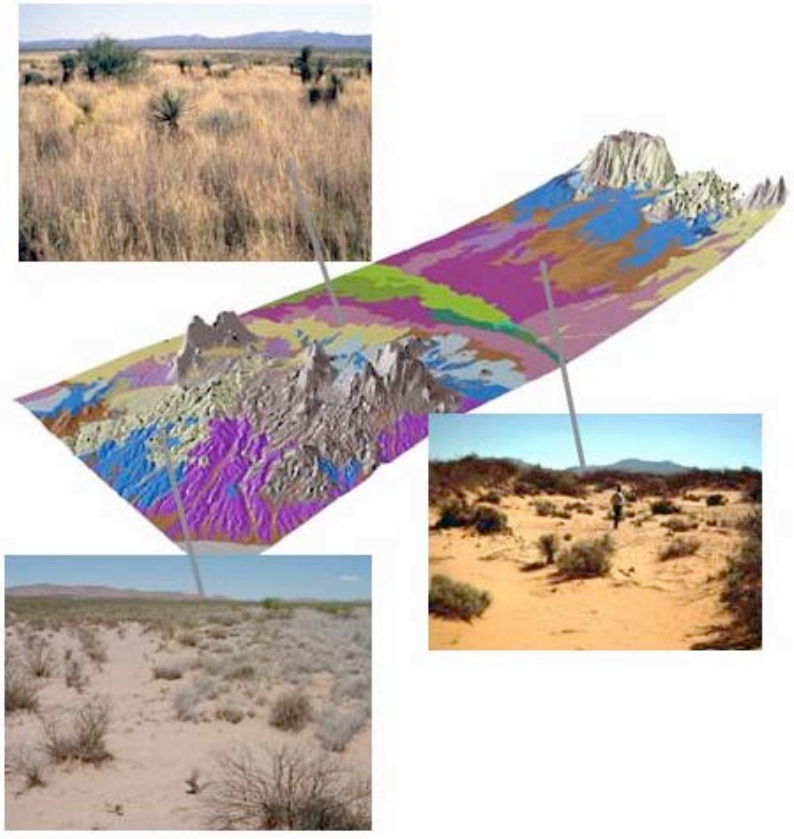



Las Cruces



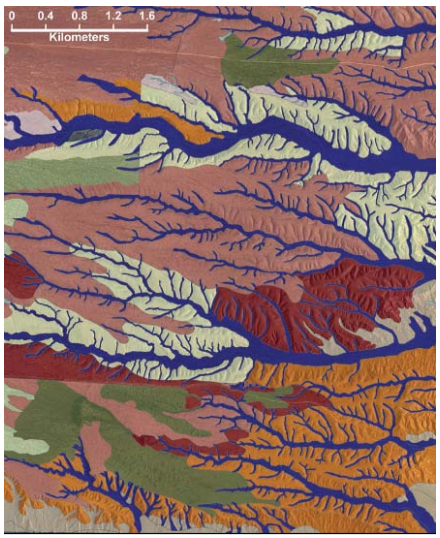
DIRECTIONAL VIRTUAL FENCE TECHNOLOGY TRANSFERRED

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to the development of "virtual" fence technology to control livestock movements within property borders. This technology uses global position systems, geographic information systems, sound and minor electrical shock (less than electric fencing) to control livestock on open rangelands. The USDA, ARS holds a patent on this technology that is licensed by a Canadian firm, Krimar. This North American firm is working to make this technology commercially available. Contact Dr. Dean Anderson (dean.anderson@ars.usda.gov) for additional information.



DESCRIBING LANDSCAPES TO MONITOR EFFECTS OF MANAGEMENT

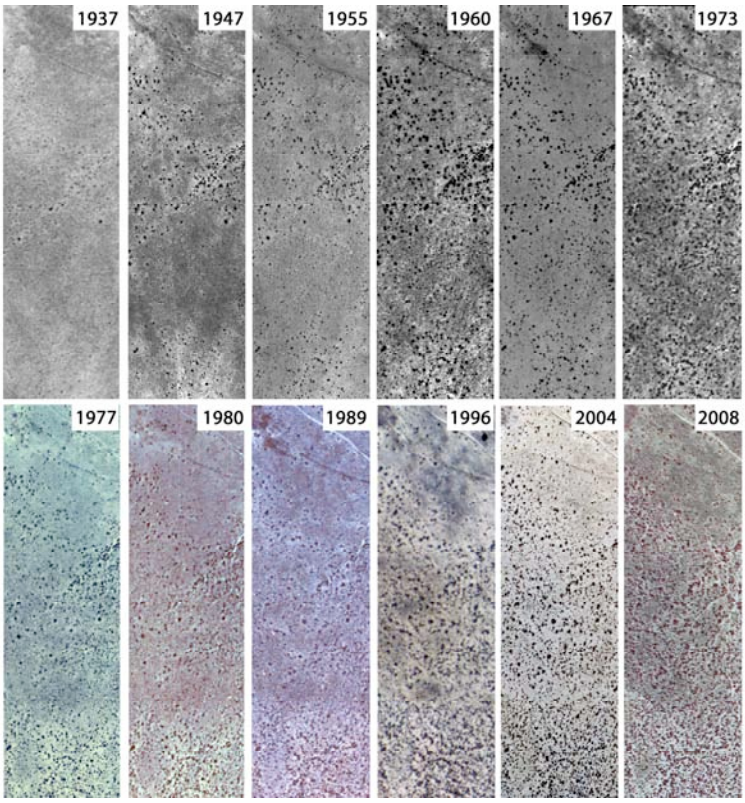
Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of ecologically-based models to describe and characterize landscapes into units that can be evaluated and monitored. Depending upon factors such as soils, local climate, and landscape position different areas of a landscape have differing potentials. Monitoring responses to management practices, such as control of invasive weeds, requires that land be delineated based on those potentials. A national system in concert with the USDA NRCS has been developed for these site descriptions. Contact Dr. Brandon Bestelmeyer (bbestelm@nmsu.edu) for additional information .



IDENTIFYING POTENTIAL FOR CARBON SEQUESTRATION ON WESTERN RANGELAND

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to refinement of technologies to inventory soil carbon on rangelands in order to predict carbon storage in soils (sequestration) in response to management.

Carbon sequestration is viewed as a possible mechanism to offset increased carbon emissions into our atmosphere that have effects on our climate. Carbon sequestration on rangeland is primarily influenced by soils and prevailing climate. Year-to-year variability in soil carbon content makes detection of real changes difficult. This research is generating the tools to detect soil carbon changes in response to management practices. Contact Dr. Joel Brown (joelbrow@nmsu.edu) for additional information.



HISTORICAL ANALYSES PROVIDE INSIGHTS ABOUT FUTURE LANDSCAPE CHANGES

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to analyses of aerial photographs from 1937-2009 that provide insights into how and why landscapes change over time. Aerial photographs have been collected over the US since the mid 1930s. Coupled with measurements on the ground from long-term research areas, these photographs can be interpreted to document the dynamics of landscape change. In the southwest, we have observed key events associated with long-term droughts in the 1930s, 1950s and 1990s. Management practices applied post-drought may be a key to combating undesirable changes in western landscapes. Contact Dr. Dawn Browning (dbrownin@nmsu.edu) for additional information.

NEW METHODS FOR MONITORING SOIL HEALTH

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of new methods to assess the health and stability of soils on western rangelands. Desert areas in the west are increasingly impacted by a variety of uses, including off-road vehicle recreation that can impact important resource conditions including water air quality. Because these lands are so diverse, methods that reflect simple average conditions are often misleading. These newer methods are spatially explicit, that reflect the diverse conditions of these expansive landscapes. Contact Mike Duniway (mduniway@nmsu.edu) for additional information.

INCREASING USE OF SHRUBS AS FORAGE BY LIVESTOCK

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to identification of chemicals in shrubs that limit use of these plants as forage by livestock. Rangelands in the U.S. and around the world have increasing amounts of shrubs that are often available as livestock forage but unused. Understanding the factors that limit use by livestock may result in practices that can overcome those limitations. **Contact:** Dr. Rick Estell (restell@nmsu.edu) for additional information.

DEVELOPMENT OF LIVESTOCK FOR DESERT ENVIRONMENTS

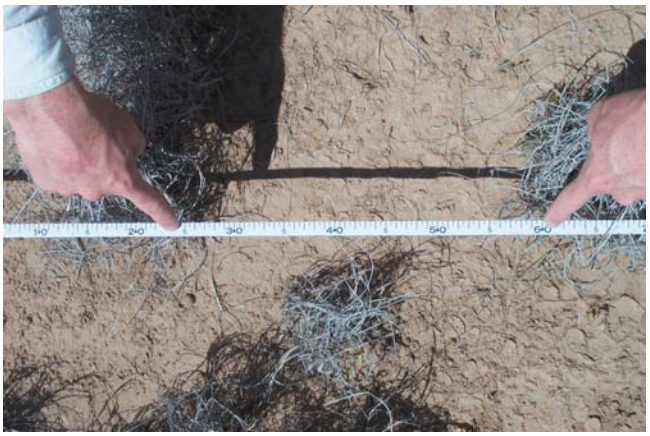
Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to identification of management practices to reduce inputs in the production of livestock from desert rangelands. The use of Criollo type cattle adapted to desert environments proved to be potentially advantageous for reducing production costs yet producing a desired meat product for local markets. Contact Dr. Ed Fredrickson (efredric@nmsu.edu) for additional information.

PRESCRIBED BURNING APPLICATIONS IN DESERT ENVIRONMENTS

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to investigation of the value of prescribed burning in arid environments. Most desert regions in the western U.S. have not experienced controlled burns for over a century, and many of these areas have experienced extensive encroachment by woody species. Though most deserts seldom have sufficient fuel loads to carry a prescribed fire, there are occasional years following excessive precipitation where fire may be a useable tool. Research indicates that even in these dry regions, burning intervals of 2 or 3 decades may be effective in reducing encroachment of desert grasslands by woody species. Contact Kris Havstad (khavstad@nmsu.edu) for additional information.

NEW IMPROVEMENTS IN NATIONAL RANGELAND INVENTORY

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of improved sampling methods for the National Rangeland Inventory (NRI) conducted by the Natural Resource Conservation Service. Every five years the rangelands in the U.S. are inventoried to provide a report to Congress on the status of the resource that comprises nearly 50% of the U.S. land area. Recent advances in sampling methodology have greatly improved the accuracy and efficiency of the sampling process and resulting data analysis. Contact Jeff Herrick (jherrick@nmsu.edu) for additional information.

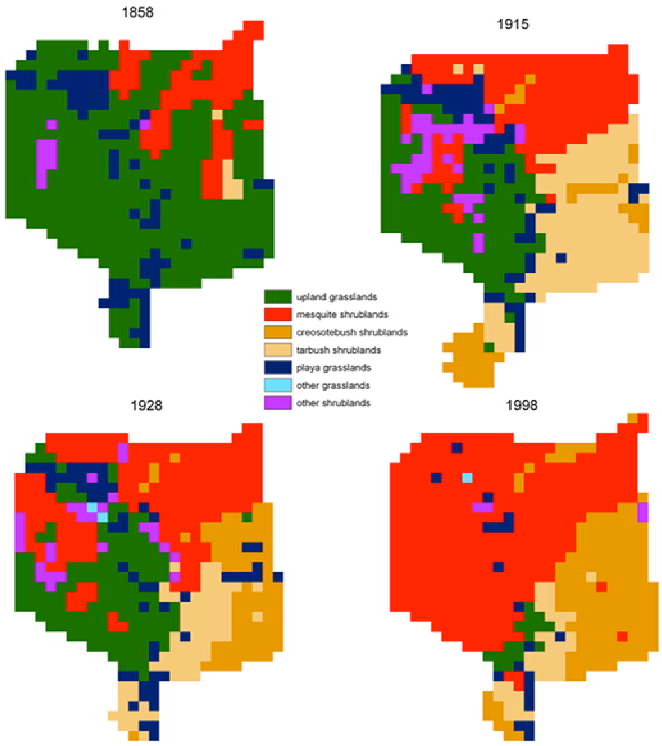


UNMANNED AERIAL VEHICLES EMPLOYED TO MONITOR LAND HEALTH

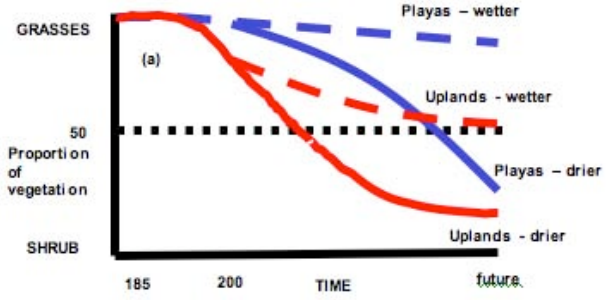
Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to use of Unmanned Aerial Vehicles (UAVs) for assessing and monitoring health of expansive rangeland areas. Monitoring of large land areas can be expensive. The use of small pre-programmed aerial vehicles to capture photographic images that can be interpreted rapidly and efficiently has global applications. This technology has been developed to monitor western U.S. rangelands managed by the Bureau of Land Management, and has application to assessing conservation practices on private rangelands where requested. Contact Andrea Laliberte (alaliber@nmsu.edu) for additional information.

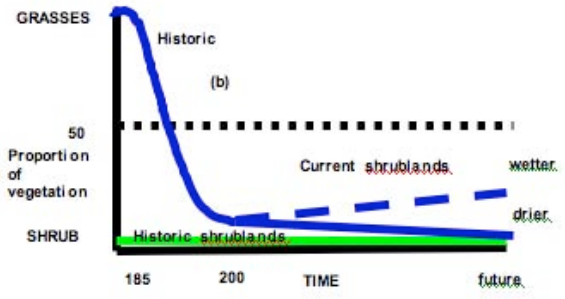
REVEGETATION TECHNOLOGIES FOR OIL WELL PAD RECLAMATION

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to the development of two technologies for revegetation of oil well pad sites with native perennial grasses. Desert areas in the southwest with oil reserves have been impacted with the effects of drilling and oil extraction. Some areas can have hundreds of degraded well pad sites requiring revegetation. The ARS lab in Las Cruces has adapted technologies for passive irrigation and enhanced native plant seedling survivals that may allow these sites to be reclaimed by revegetation with the original native grass species. Contact Dr. Mary Lucero (mary.lucero@ars.usda.gov) for additional information.

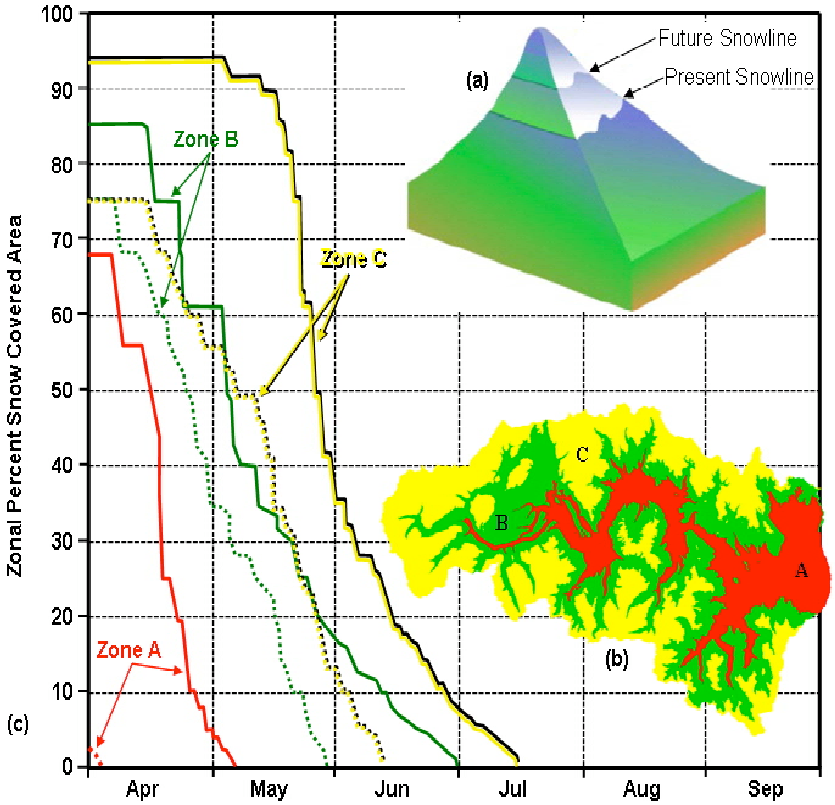


DEVELOPING PREDICTIONS OF FUTURE DYNAMICS OF REGIONAL LANDSCAPES



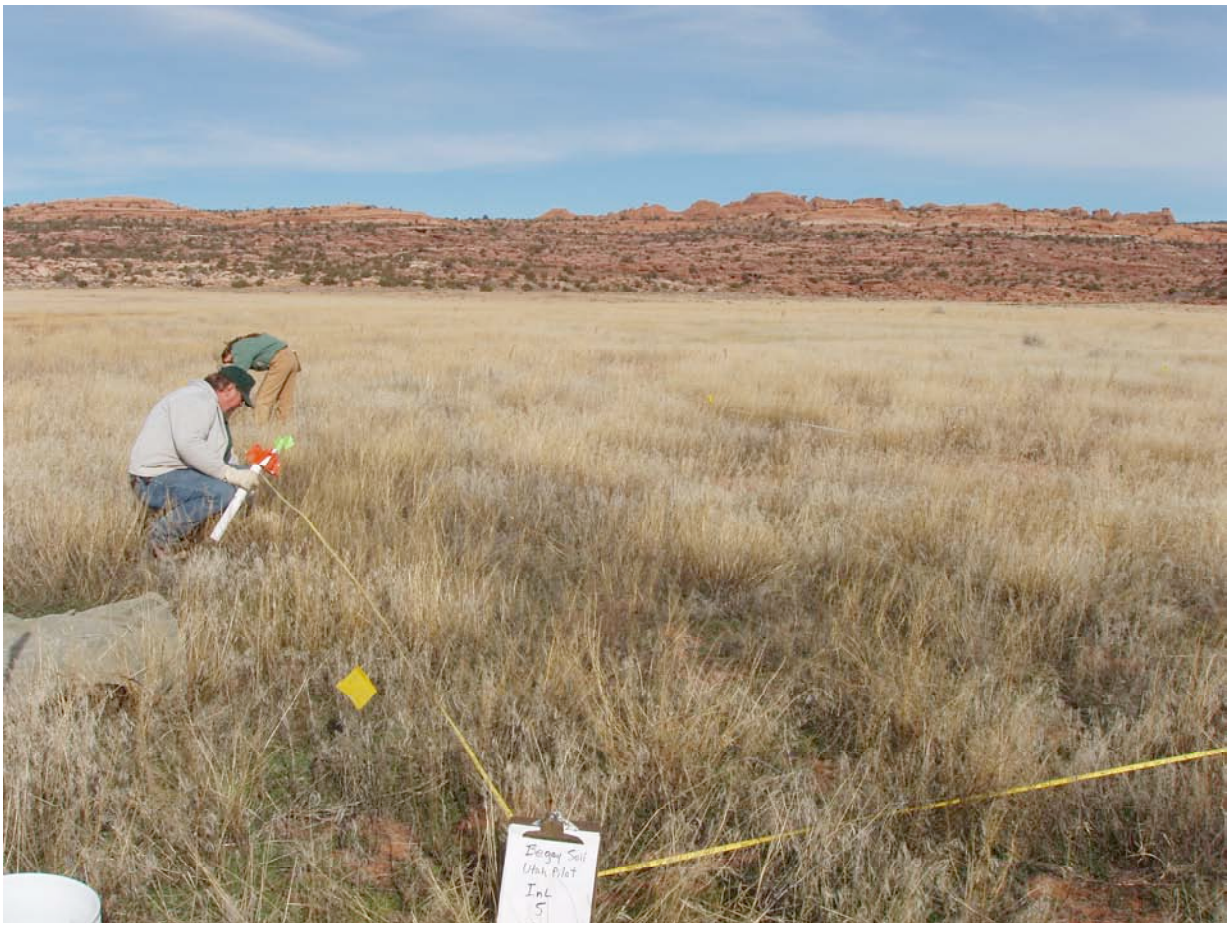


Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of models that project an accelerated loss of grasslands across regions of the southwest with decreasing amounts of annual precipitation. These models were based on analyses of vegetation trends and climatic records recorded over the last 140 years. However, though temperatures are predicted to rise, changes in precipitation amounts are quite uncertain. Future wet periods could reverse trends of desertification and we could experience grassland recovery. **Contact:** Dr. Deb Peters (debpeters@nmsu.edu) for additional information.



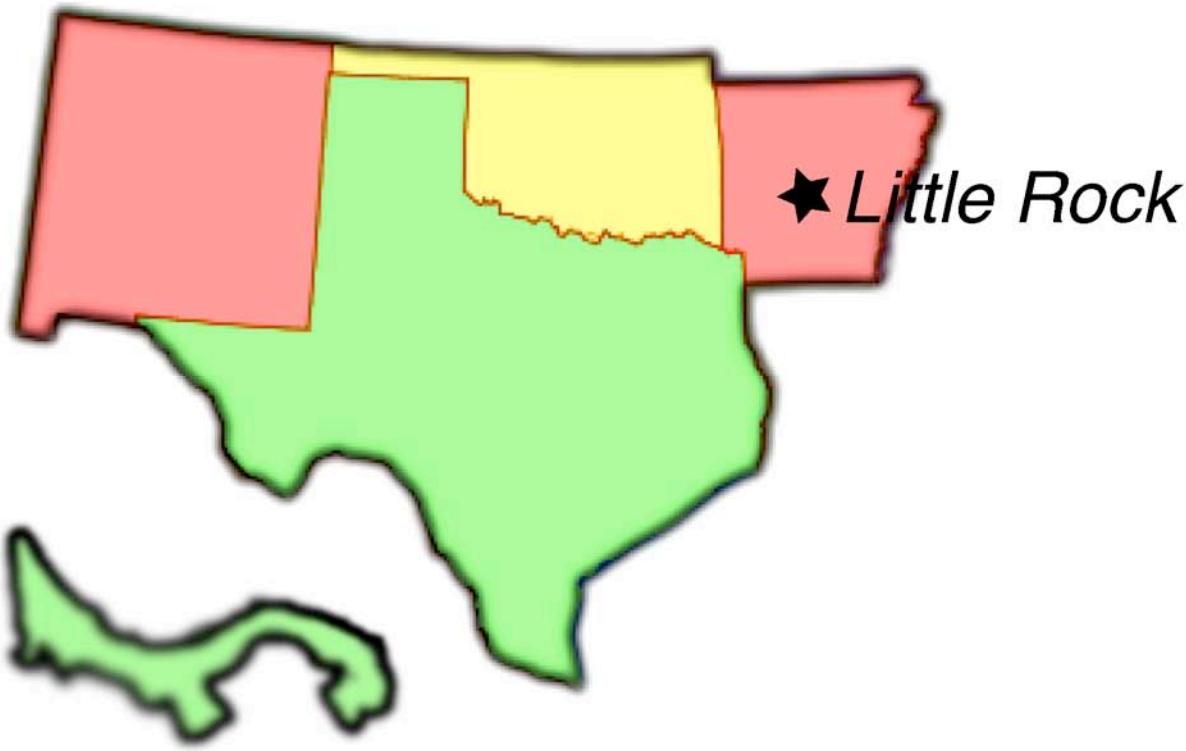
PREDICTIONS FOR SNOW COVER AND RUNOFF FOR WESTERN WATERSHEDS

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of models based on remotely-sensed snow cover estimates that predict runoff water yields for western watersheds. A primary determining factor for downstream water yields for irrigated agricultural, domestic uses, and conservation needs is the amount and timing of snow cover in the mountainous regions of large watersheds. Models that utilize readily available, satellite-based images of snow cover can fairly accurately predict resulting yields for the Rio Grande River in New Mexico and the Kings River in California prior to spring snow melt and runoff. Model outputs can be used by irrigation district offices to plan water allocations prior to spring runoff. Contact Dr. Al Rango (alrango@nmsu.edu) for additional information.



MONITORING PROCEDURES TO DETERMINE HEALTH OF SOILS

Research at the Rangeland Research Unit based at the Jornada Experimental Range in Las Cruces, New Mexico led to development of monitoring and assessment procedures to detect effects of land management practices on soil health. Producers and land managers need readily obtainable information about soil properties in order to plan management practices. Guides to monitor soil change are available at soil.usda.gov. Contact Dr. Arlene Tugel (atugel@nmsu.edu) for additional information.


Little Rock

TAKING SMALL STEPS IN THE DELTA FOR USING THE DIETARY GUIDELINES

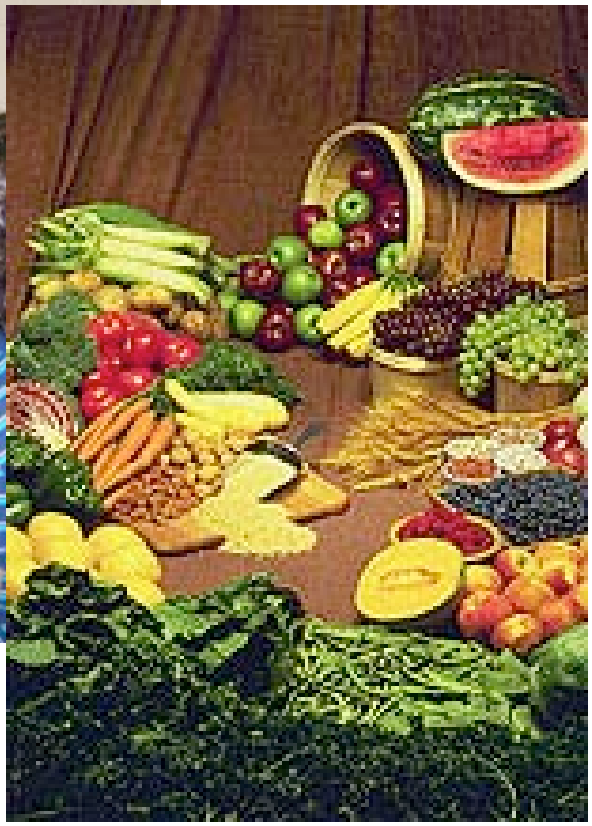
The Foods of Our Delta Study 2000 revealed that Lower Mississippi Delta (LMD) residents had higher rates of obesity and lower quality diets than the rest of the nation. Such findings are indicative of not adhering to recommendations of the Dietary Guidelines for Americans (DG). Delta Obesity Prevention Research Unit (Delta OPRU) researchers will examine previously collected LMD data to develop a priority list of tools, techniques, and technology. Findings will be compiled into a Delta DG Tool Kit that will consist of healthy Delta menus, shopping lists, food selection tips, and food preparation methods. The Delta DG Tool Kit will be tested for feasibility with families and will be used in a larger study to determine the effectiveness in promoting DG adherence and obesity prevention over time. Contact Dr. Beverly McCabe-Sellers (bev.mccabe-sellers@ars.usda.gov) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov) for additional information.

GARDENING TO REDUCE OBESITY AND OTHER RISK BEHAVIORS IN DELTA CHILDREN

Cooperating researchers at the Arkansas Children's Hospital Research Institute are using a school gardening program designed to increase students' school bonding (connection/association) to determine if it will increase physical activity and fruit/vegetable intake. The lessons will adhere to the State of Arkansas benchmarks for 6th -8th grade science, health, and physical education curriculum. A larger study will involve testing the gardening program in 12 additional Delta schools to test the effectiveness of adherence to the Dietary Guidelines and reducing obesity and related chronic disease risk factors. Researchers anticipate that students who participate in the gardening program will be more strongly affiliated (bonded) with their school/teachers, and will increase their fruit/vegetable intake and physical activity levels from the beginning to the completion of the program. Contact Dr. Judy Weber (weberjudithl@uams.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov) for additional information.

EFFECTIVENESS OF WOMEN'S SOCIAL CLUB MEMBERS ADOPTING MODIFIED DIETARY GUIDELINES

Obesity rates in the Lower Mississippi Delta region are among the highest in the U.S., with less than 7% of Delta adults consuming a healthy diet that can reduce the risk of obesity. Evaluating the existing food patterns of Delta adults is needed. Adapting these existing patterns to meet the Dietary Guidelines for Americans will be achieved through the research conducted by the University of Southern Mississippi cooperating scientists. Minor, however effective, modifications will be made to existing dietary patterns and evaluated for successful implementation in Mississippi social women's organizations over a 12 month period. Successful results will improve the diets of dietary residents, specifically weight status and healthy blood pressure. For additional information, contact Dr. Carol Connell (carol.connell@usm.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov).

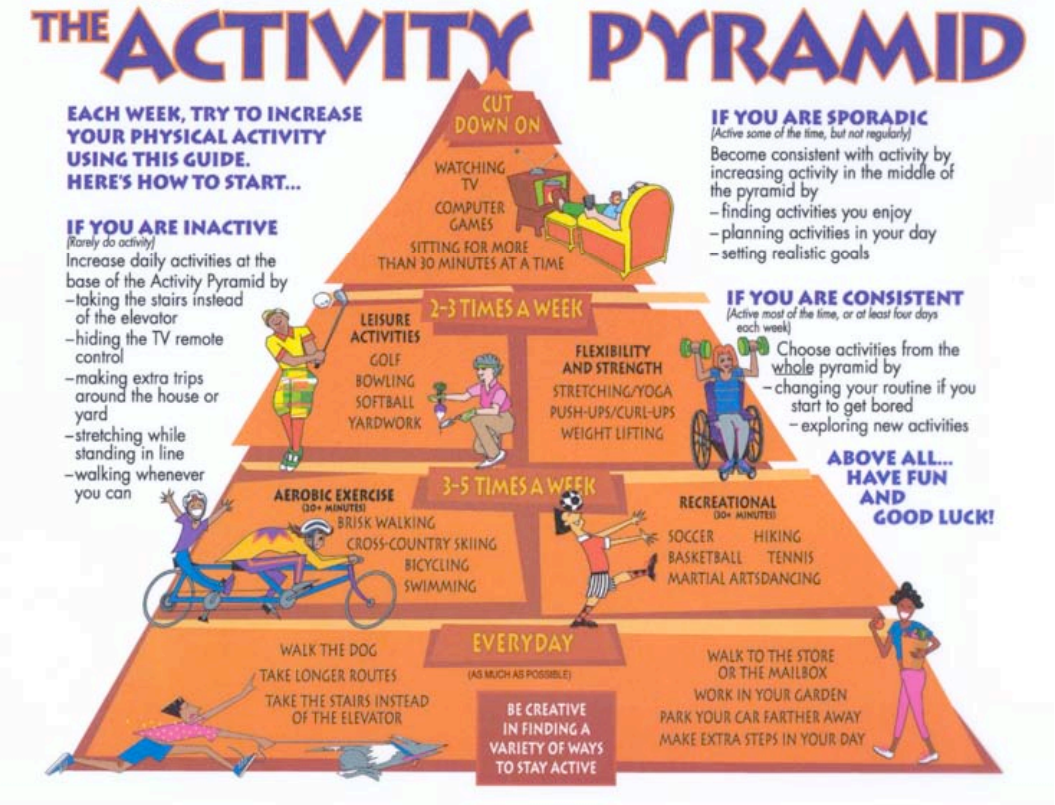


EFFECTIVENESS OF WOMEN'S SOCIAL CLUB MEMBERS ADOPTING MODIFIED DIETARY GUIDELINES

Cooperating researchers at the University of Arkansas at Pine Bluff are conducting qualitative and quantitative research that will be used to explore the dietary and physical activity patterns common to African-American college/university students in the Delta region. This will be used to develop an educational program. *Eating to Live*, which will be used to show students how to appropriately evaluate their personal diet and physical activity patterns and empower them to make lifestyle changes with the long-term goal of lifetime weight maintenance. This research will provide culturally sensitive strategies, to increase adoption of the dietary guidelines. Additional information can be obtained by contacting Dr. Sheila Garland (garlands@uapb.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov)

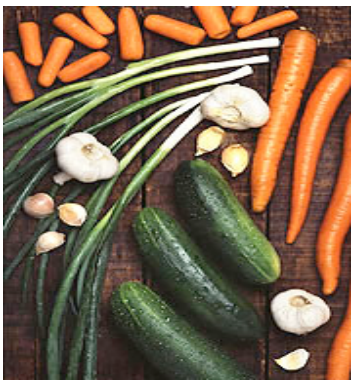
STEPS TO ADAPT PHYSICAL ACTIVITY GUIDELINES FOR THE LOWER MISSISSIPPI DELTA

Cooperating researchers at the Pennington Biomedical Research Center are determining ways in which physical activity patterns of adults in the Lower Mississippi Delta can be effectively adapted to the 2005 physical activity recommendations of the Dietary Guidelines for Americans. Through the use of pedometers and an educational program, delta residents will self monitor their progressive steps to meet these national recommendations. Through a successful physical activity implementation and an adapted eating pattern, anticipated results include a reduction of unhealthy weight gain and an increase in physical activity levels. For additional information, contact Dr. Peter Katzmarzyk (peter.katzmarzyk@pbrc.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov).



ENHANCING FRUIT/VEGETABLE CONSUMPTION OF AFRICAN-AMERICAN MOTHERS AND CHILDREN IN SOUTHWEST

The prevalence of childhood obesity is of great proportions amongst rural, limited resource populations in the Lower Mississippi Delta region and particularly in Mississippi. Cooperating researchers at Alcorn State University are conducting research to reduce the current levels of obesity in these populations. Researchers will utilize a pre-/post-test design to determine the effectiveness of combining nutrition education with social support to help mothers make dietary changes. These changes will be monitored by looking for an increased consumption level of fruits and vegetables in the mother and her children (middle school age) Physical activity promotion will be provided to the children as a motivational factor to make healthier food choices. Contact Dr. Wanda Newell (wnewell@alcorn.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov) for additional information.



Ways to Enhance Children's Activity & Nutrition

ADOPTING THE DIETARY GUIDELINES' EATING PATTERNS AND PHYSICAL ACTIVITY RECOMMENDATIONS FOR THE DELTA AFRICAN-AMERICANS

Reducing weight gain and risk factors for obesity-related chronic diseases in Lower Mississippi Delta African American parents and their children is of major concern. Southern University & A&M College cooperating scientists are utilizing a culturally tailored intervention (*We Can!)* (NIH-NHLBI, 2009) which is designed to educate parents how to encourage their children to improve food and physical activity behaviors by modifying the youth's beliefs and values.

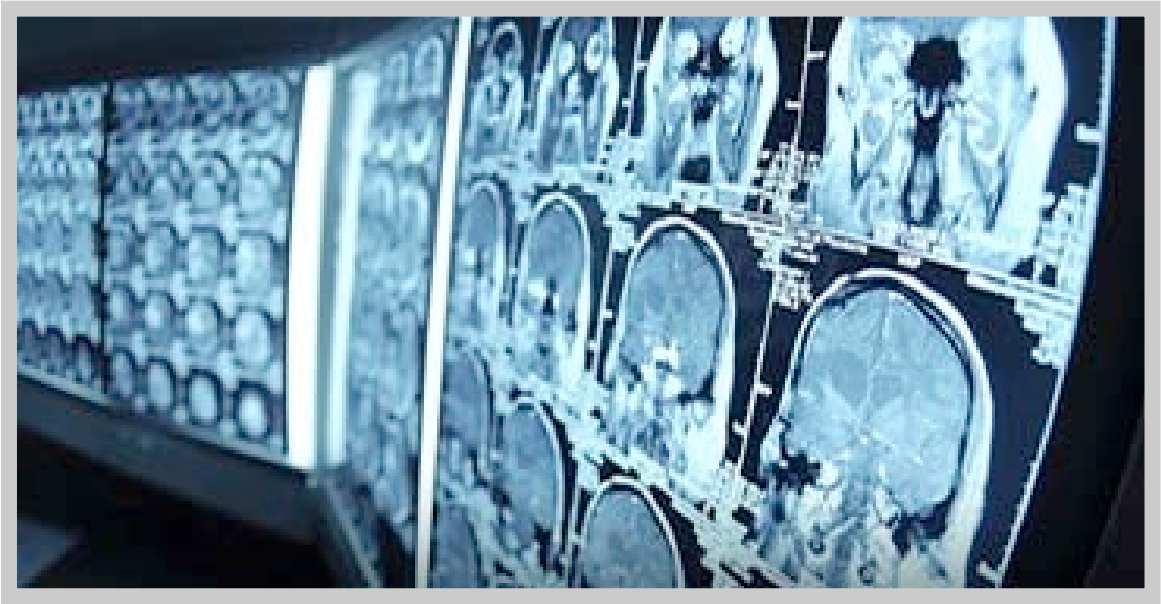
Changes in the Health Eating Index (HEI) scores, physical activity level, percent body fat, and chronic disease biomarkers will provide the researchers with an overall understanding of the effectiveness level of the intervention *We Can!* For additional information, contact Dr. Bernestine McGee (bmcgee@subr.edu) or Dr. Margaret L. Bogle (margaret.bogle@ars.usda.gov).

Arkansas Children's Nutrition Center

USDA, ARS
Arkansas Children's Nutrition Center

Mission Statement

The mission of the Arkansas Children's Nutrition Center is 1) to conduct research to examine the effects of nutrition and diet on central nervous system development and function of infants and children; and 2) to determine the effects of early dietary factors (phytochemicals) contained in vegetables, fruits and grains on the long-term health consequences of children.



EFFECTS OF INFANT DIET ON DEVELOPMENTAL PROCESSES

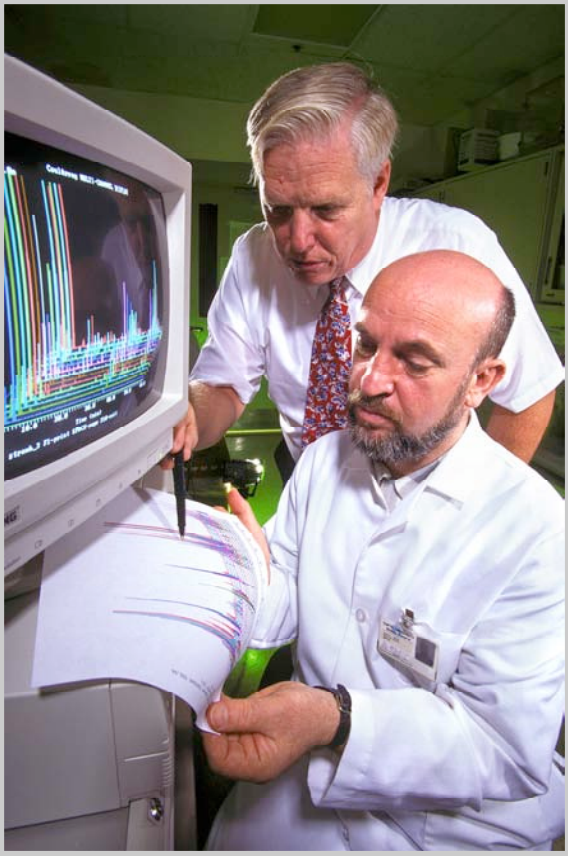
Scientists at the Arkansas Children's Nutrition Center are using behavioral assessments and measures of physiologic activities (brain and autonomic measures) to evaluate the effects of specific patterns of nutrient intake on brain function, cognitive development and physical health in infants, children and adolescents. Researchers are conducting longitudinal studies to evaluate the effects of infant diet (breast-milk, milk-, soy -, and monosaccharide supplemented-formula) on developmental processes from early infancy through early adolescence and a series of studies examining the effects of diet, meal patterns and meal frequency on brain function and behavioral dynamics in school-aged children. For additional information, contact Dr. Terry Pivik (pivikterry@uams.edu).

UNDERSTANDING CHILDHOOD AND ADULT OBESITY

Arkansas Children's Nutrition Center scientists are dedicated to optimizing pediatric and maternal nutrition to improve children's development and prevent childhood and adult diseases. Studying the programming of childhood and adult obesity during pregnancy and in early life is one of the ways they are fulfilling their mission. Through collaborative studies, scientists are able to provide true translational approaches to the understanding and potential prevention of the developmental origins of childhood and adult obesity. For additional information, please contact Dr. Aline Andres (andresaline@uams.edu).

HEALTH EFFECTS OF PHYTOCHEMICALS

Arkansas Children's Nutrition Center scientists are focusing on the health effects of phytochemicals in fruits and vegetables. This is being done through the development of analytical techniques for quantifying the phytochemical and antioxidant capacity in fruits and vegetables, which has led to the expansion of the USDA Food Nutrient Database; in particular, the addition of data on antioxidants, anthocyanins, and proanthocyanidins and information on antioxidant capacity (ORACFL). To learn more about this research contact Dr. Ronald Prior (ron.prior@ars.usda.gov or priorronaldl@uams.edu).

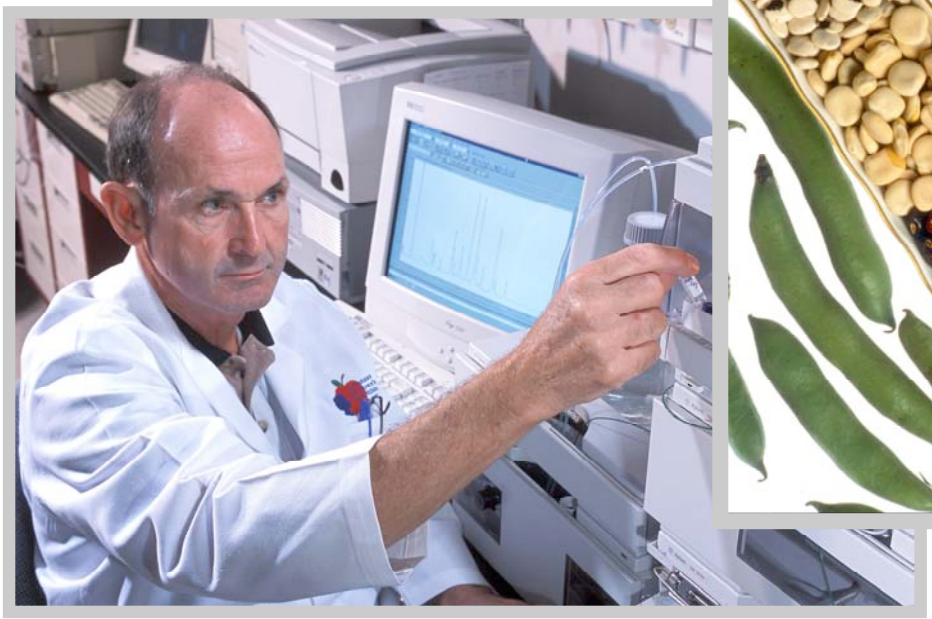


CONSEQUENCES OF MOTHER'S OBESITY ON CHILDHOOD OBESITY

Arkansas Children's Nutrition Center scientists are conducting studies to better understand how obesity may begin very early in life, perhaps as early as conception or during development in the womb. Specifically studies are aimed at addressing the long-term consequences of mom's obesity, prior to conception, on the health of the offspring. To this end they utilize a range of experimental tools which include animal models, genomics, molecular biology and cell culture to study the integrative biology of obesity. Understanding of mechanisms underlying such fetal programming through basic and translational studies will provide novel opportunities for effective intervention. To learn more about this research contact Dr. Kartik Shankar, PhD (shankarkartik@uams.edu).

SOY-BASED INFANT FORMULA'S EFFECT ON PREVENTION OF ADULT DISEASES

One of the most important environmental components in people's lives is diet. Investigators at the Arkansas Children's Nutrition Center are focusing their attention to the long-term health consequences of early nutrition and diet, specifically for the prevention of adult diseases such as breast, prostate, or colon cancer. Specific diets being studied include the use of soy-based infant formulas. Although these formulas have been on the market for nearly half a century, few long-term studies have been conducted on the long term impact of soy formula use for the prevention of some cancers. For more information, contact Dr. Thomas Badger (badgerthomasm@uams.edu).



PROTECTIVE EFFECTS OF INFANT FORMULAS ON ADULT MAMMARY CARCINOMA

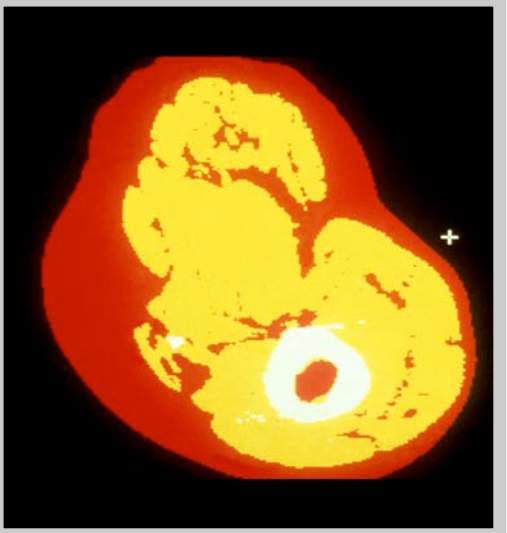
Arkansas Children's Nutrition Center Investigators are studying molecular endocrinology and tumor biology to evaluate key regulators in the development and function of female reproductive tissues, namely uterus and mammary gland. The goal of this research is to increase our understanding of the signaling pathways that affect the female reproductive tissues' response to steroid hormones and growth factors during normal development and which may be compromised leading to abnormal development. Through animal model studies, ACNC researchers have identified several molecular mechanisms involving tumor suppressors and oncogenes that may underlie the protective effects of dietary components present in infant formulas (whey and soy proteins) on the adult onset of mammary carcinoma. A major goal is to determine the developmental window, dose, and duration of sensitivity to nutritional components that will predispose newborns and young adults to a healthy life at adulthood. Additional information can be obtained by contacting Dr. Rosalia C.M. Simmen (simmenrosalia@uams.edu).

EFFECTS OF EARLY NUTRITION ON DEVELOPMENT OF ADULT CHRONIC DISEASES

Understanding the long term health consequences of early nutrition in the infant is critical for the health of current and future generations. Arkansas Children's Nutrition Center scientists are examining the effects of early nutrition on the development of chronic diseases in adulthood such as cancer, obesity and nonalcoholic steatohepatitis (NASH). As associations between diet and disease prevention are identified, such research results should have global importance. For additional information regarding this research, contact Dr. Martin Ronis (ronismartinj@uams.edu).

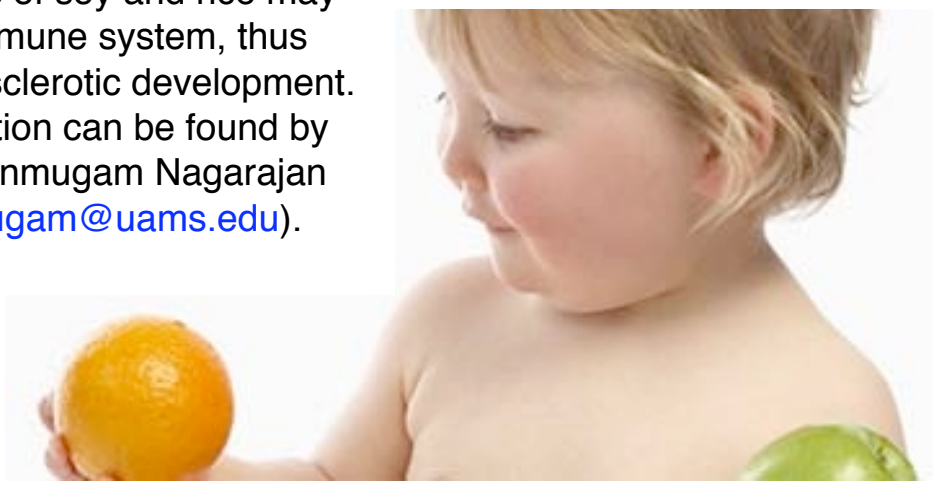
THE ROLE OF DIET ON BONE AND BONE MASS

In postnatal life, childhood exposure to slow-acting environmental factors, primarily through the diet, begin to condition adults toward either resistant or susceptibility to chronic disease occurring. Diseases such as osteoporosis may be influenced by bone mineral accumulation during childhood and adolescence. Arkansas Children's Nutrition Center scientists are conducting studies to better understand the role of diet on bone and how much bone should be built before adulthood in order to reduce the frequency of bone fracture due to osteoporosis later in life. A wide range of experimental approaches utilizing different animal models, diets, examining cell molecular mechanisms of bone development are involved in these research projects. To learn more about this research contact Dr. Jin-Ran Chen (chenjinran@uams.edu).



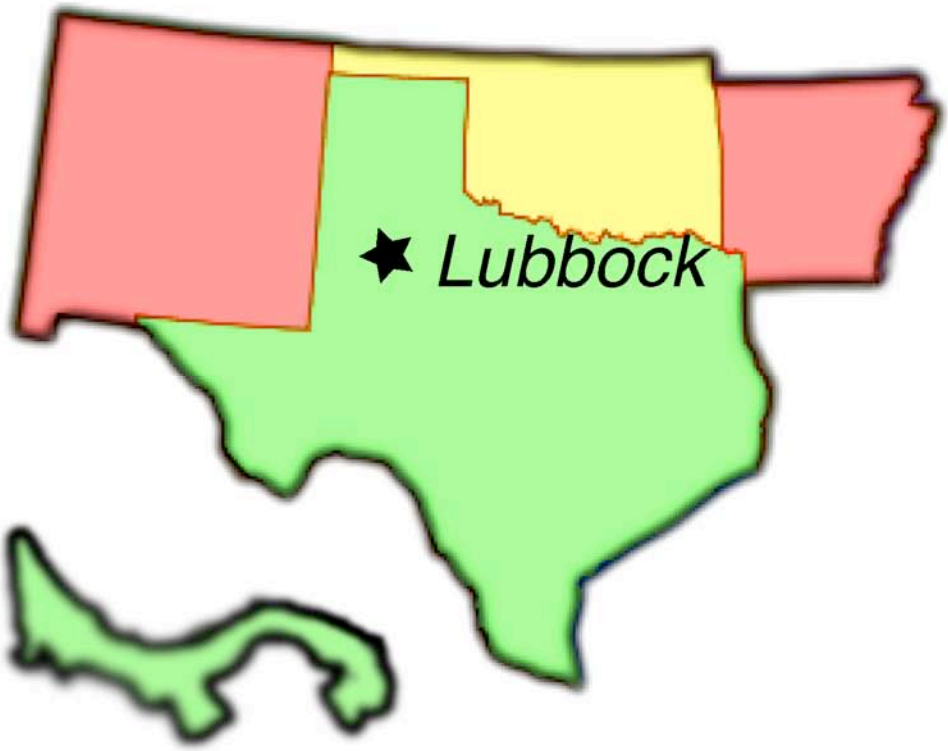
EARLY DIETARY IMPACT ON IMMUNE SYSTEM FOR PREVENTION OF ATHEROSCLEROSIS

Arkansas Children's Nutrition Center research scientists are interested in understanding the role of the early dietary impact on the immune system for the prevention of early developmental stages of atherosclerosis. Recent studies have suggested that inflammation initiated by high LDL-cholesterol levels and immune cell activation may contribute to the development of atherosclerosis later in life. Additionally, it is well known that cardiovascular incidence is generally lower in the Asian population and it is plausible that diets of soy and rice may also impact the immune system, thus preventing atherosclerotic development. Additional information can be found by contacting Dr. Shanmugam Nagarajan (nagarajanshanmugam@uams.edu).



EFFECTS OF EARLY NUTRITION INTERVENTION OF BERRIES ON PREVENTION OF CVD

Fruits and vegetables as part of the daily diet could help prevent cardiovascular diseases (CVD). Arkansas Children's Nutrition Center scientists are studying the effects of early nutritional intervention of berries on the development of atherosclerosis in adult life. Research is aimed at understanding underlying mechanisms in animal models and cell culture, and to identify bioactive components in berries that prevent CVD. The use of natural antioxidants and plant compounds that affect atheroprotection would be of great clinical relevance. For additional information regarding to the research, contact Dr. Xianli Wu (wuxianli@uams.edu).


Lubbock

USDA-ARS
CROPPING SYSTEMS RESEARCH LABORATORY
LUBBOCK, TEXAS







Mission Statement of the Cropping Systems Research Laboratory

The mission of the Cropping Systems Research Laboratory is to develop fundamental, long-range research programs in Plant Stress and Germplasm Development, Wind Erosion and Water Conservation, Cotton Production and Processing, and Livestock Issues. The overall mission is subdivided among four multidisciplinary research units. All major crops and soil types, and significant animal production exist within a 50-mile radius of the Laboratory. This diversity of cropping systems, soil types, and livestock industries allows Laboratory scientists the opportunity to relay their fundamental information directly to their applied counterparts in State Agricultural Experiment Stations, private industry, commodity organizations, and other user groups.

Dr. John J. Burke, Laboratory Director
3810 4th Street
Lubbock, TX 79415
806-749-5560

IRRIGATION SCHEDULING TECHNOLOGY TRANSFERRED

Research at the Cropping Systems Research Laboratory led to the development of a biologically-based irrigation scheduling protocol and named it 'BIOTIC' for Biological Identified Optimal Temperature Interactive Console. This technology allows producers to save water by determining when their crop actually needs irrigation. The USDA, Agricultural Research Service holds a patent on this technology application known as BIOTIC or Time-Temperature-Threshold. Accent Engineering Inc., licensed the BIOTIC technology and cooperatively developed a hardware and software package currently available commercially. Contact Dr. James Mahan (james.mahan@ars.usda.gov) for additional information.

STRESS TOLERANT PEANUT LINE IDENTIFIED

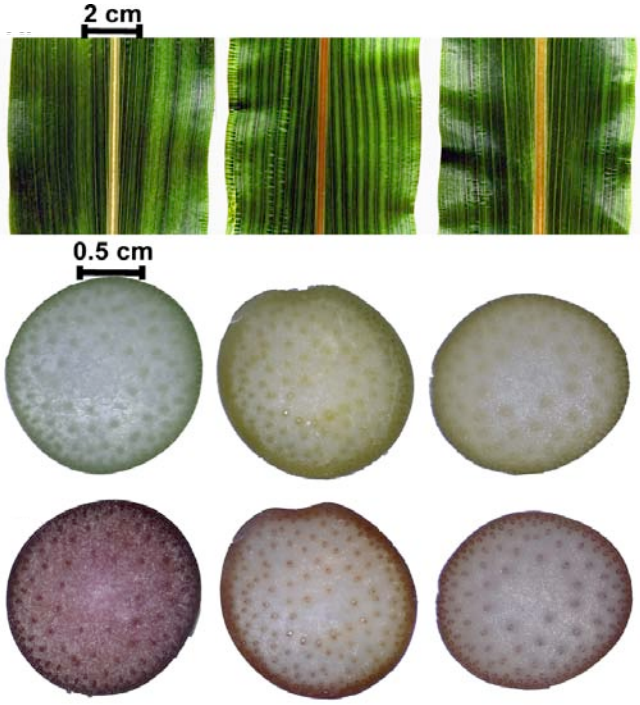
Research at the Cropping Systems Research Laboratory in collaboration with Texas Tech University, Texas Agrilife Research, and New Mexico State University has lead to the identification of a peanut line with enhanced temperature and drought stress tolerance. Contact Dr. Paxton Payton (paxton.payton@ars.usda.gov) for additional information.

SORGHUM COLD TOLERANCE IDENTIFIED

Research at the Cropping Systems Research Laboratory evaluated sorghum collections for improved germination and stand establishment at low temperatures. Lines with enhanced cold tolerance have been identified and movement of this trait into improved germplasm is underway. Contact Dr. Gloria Burow (gloria.burow@ars.usda.gov) for additional information.

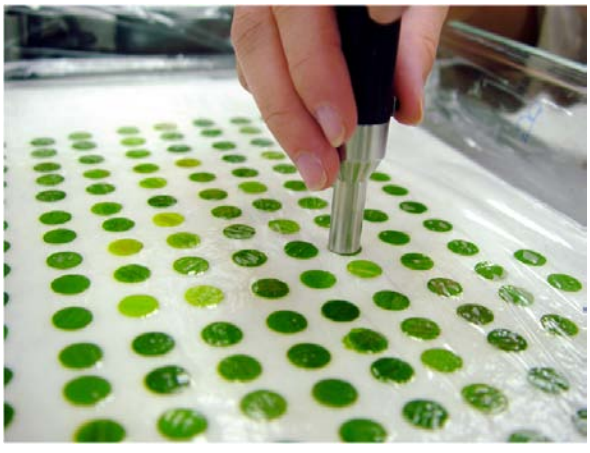
SORGHUM GENETIC RESOURCE DEVELOPED

Researchers at the Cropping Systems Research Laboratory developed a genetic resource for functional genomics. The sorghum collection is called the Annotated Individually Mutagenized Sorghum (AIMS) lines. Beneficial phenotypes within the collection include erect leaves, monoculm, brown midrib, and increased head size. Contact Dr. Zhanguo Xin (zhanguo.xin@ars.usda.gov) for additional information.



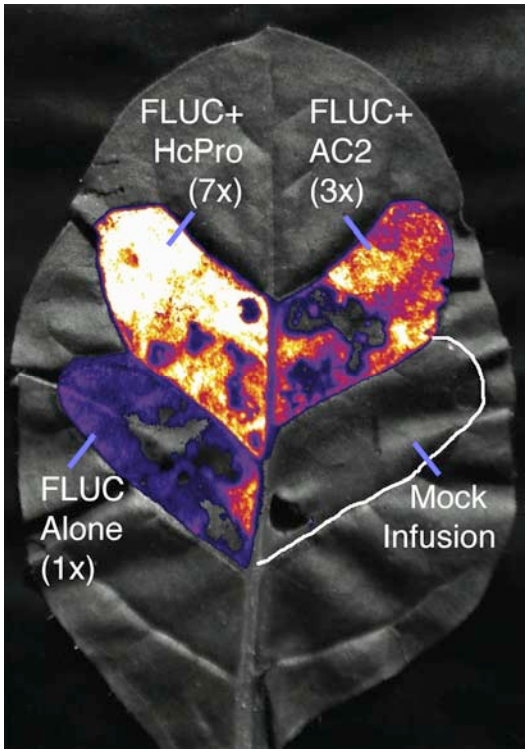
SORGHUM DROUGHT TOLERANCE BIOASSAY DEVELOPED

Researchers at the Cropping Systems Research Laboratory developed an assay to identify “stay-green” sorghums without the requirement of post flowering water stress. Contact Dr. John Burke (john.burke@ars.usda.gov) for additional information.



POST TRANSCRIPTIONAL GENE SILENCING IDENTIFIED

Research at the Cropping Systems Research Laboratory has used anthocyanin pigment production as an indicator of gene silencing in plants. The induction of and induced loss of this purple pigment provides a visual tool for evaluating the location and degree of gene silencing. The scientists have evaluated suppressors of silencing as a means to enhance gene expression in plant vegetative tissues. This study is dissecting one of the newly discovered mechanisms that plants use to regulate gene expression. Contact Dr. Jeff Velten (jeff.velten@ars.usda.gov) for additional information.



CORN HEAT SENSITIVITY UNCOVERED

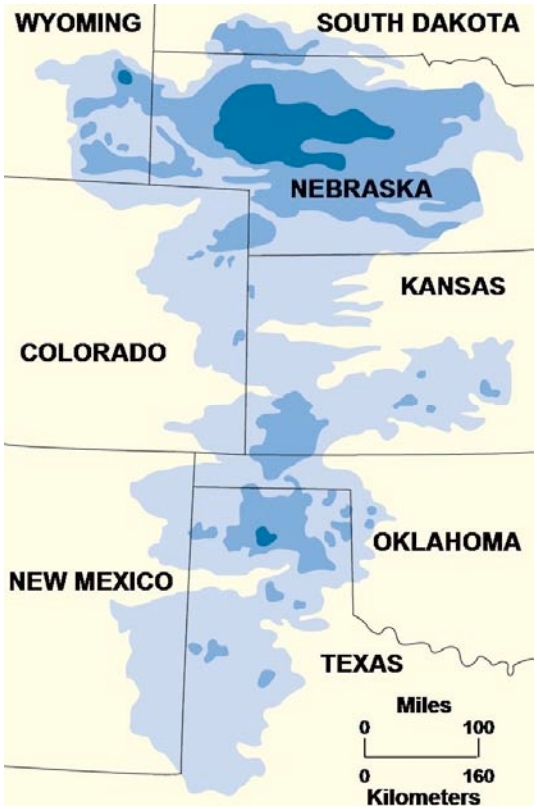
Research at the Cropping Systems Research Laboratory, in collaboration with Texas AgriLife Research, has discovered the reason for observed heat sensitivity in some corn varieties. High temperatures in the field caused leaf firing and tassel blasting in the developing tissues of the sensitive line B106, but not in those of the tolerant line B76. The research identified a reduction in a specific membrane lipid leading to the heat sensitivity. Contact Dr. Junping Chen (junping.chen@ars.usda.gov) for additional information.

GETTING TO THE ROOT OF THE PROBLEM

Scientists at the Cropping Systems Research Laboratory are evaluating genetic diversity in cotton rooting. Root development and water uptake under subsurface drip irrigation are studied to identify germplasm with enhanced water capturing characteristics. Contact Dr. Bobbie McMichael (bobbie.mcmichael@ars.usda.gov) for additional information.

USDA YIELD ENHANCEMENT TECHNOLOGY

Research at the Cropping Systems Research Laboratory has lead to the development of a seed - seedling treatment that enhances yields 5 to 20% under water limiting conditions. Yield enhancements in cotton have been obtained annually in three years of field trials in Lubbock, Texas. Preliminary results show a 10% yield increase in chili peppers using this yield enhancement technology. Contact Dr. John Burke (john.burke@ars.usda.gov) for additional information.

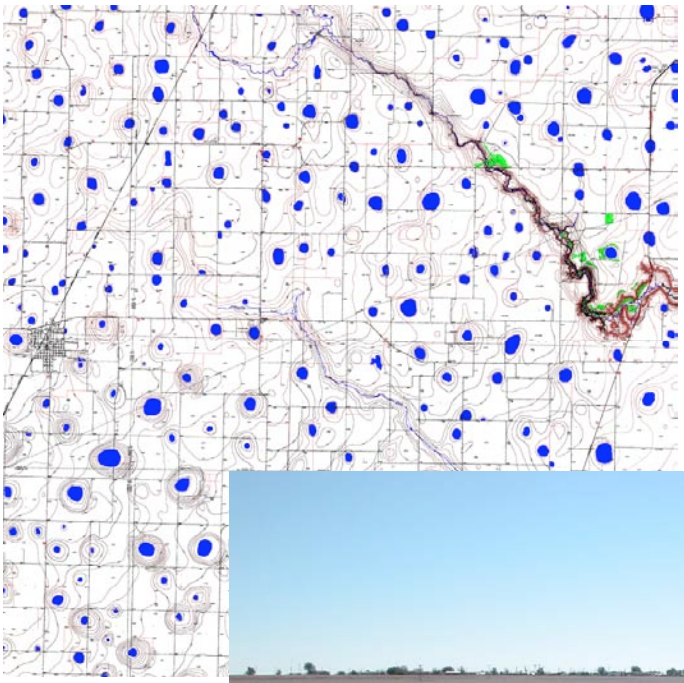


SEASONAL CLIMATE FORECAST INFORMATION IN MANAGING COLD SEASON FORAGE

Research at the Cropping Systems Research Laboratory used forecast information based on the development of the El Nino Southern Oscillation as a potentially useful tool in managing cold season forage crops over the Southern High Plains. Contact Dr. Steve Mauget (steve.mauget@ars.usda.gov) for additional information.

PLAYA RECHARGE OF THE OGALLALA AQUIFER DETERMINED

Researchers at the Cropping Systems Research Laboratory, in collaboration with Texas Tech University scientists, measure the recharge rate of the Ogallala for both cropland and playas. Soil thermometers are used to track rainwater's downward movement through soil. The thermometers track rainwater by detecting sudden changes in temperature where rainwater stops seeping. Contact Dr. Dennis Gitz (dennis.gitz@ars.usda.gov) for additional information.

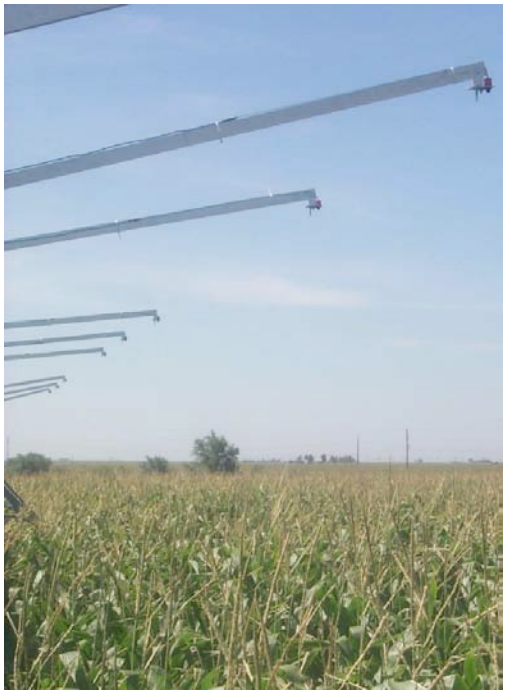


SOIL MANAGEMENT FOR SUSTAINABLE AGRICULTURAL SYSTEMS THAT PREVENT WIND EROSION

Researchers at the Cropping Systems Research Laboratory evaluate the sustainability and environmental effects of cropping systems on soil and air resources. Their studies quantify airborne soil particle transport and fine dust emissions as affected by soil texture and cropping systems. They also develop and test indexes used to evaluate soil management decisions and determine the effects of cropping systems on soil properties. Their findings show that although the Soil Quality Index may be correlated with soil organic carbon in irrigated conditions, it may not be well correlated in dryland conditions. Contact Dr. Ted Zobeck (ted.zobeck@ars.usda.gov) for additional information.

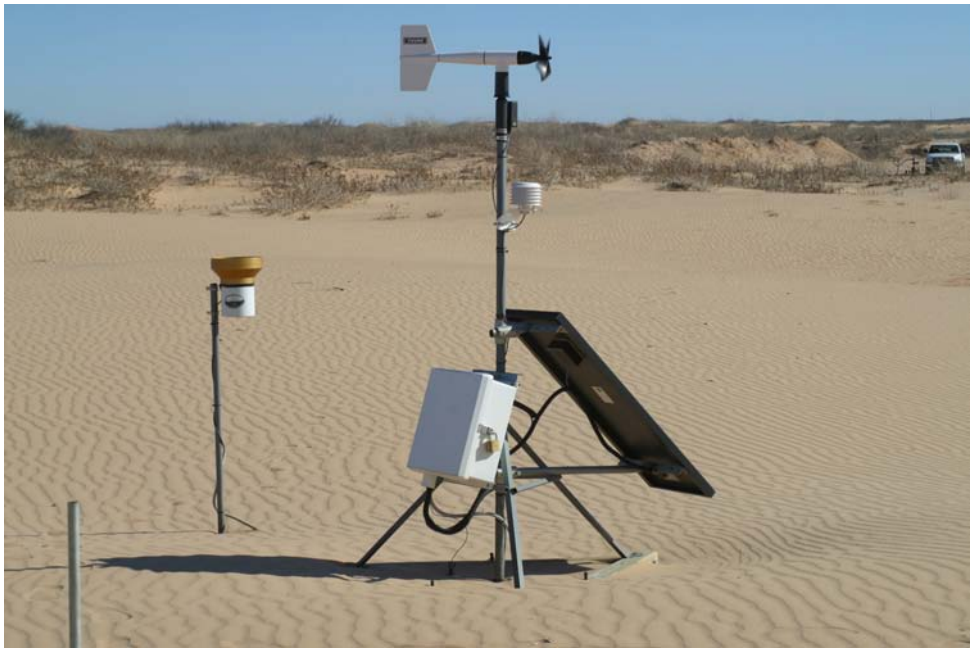
RATES OF SOIL REDISTRIBUTION BY WIND DETERMINED

Researchers at the Cropping Systems Research Laboratory evaluate the sustainability and environmental effects of cropping systems on soil and air resources. Their studies quantify airborne soil particle transport and fine dust emissions as affected by soil texture and cropping systems. The research has shown that models developed to estimate water erosion and deposition were also applicable to wind erosion provided that the models contained a particle size correction parameter that accounts for selective soil loss of smaller particle sizes and deposition of larger or smaller particle sizes than the median particle size for the source soil. Contact Dr. Scott Van Pelt (scott.vanpelt@ars.usda.gov) for additional information.



MANAGING LIMITED IRRIGATION AND RAINFALL

Researchers at the Cropping Systems Research Laboratory evaluate surface hydrological processes that increase the efficiency of water use by crops using simulation models and landscape-scale field experiments. Our aim is to develop management practices that improve crop yield under limited water and for dryland cropping systems. Contact Dr. Robert Lascano (robert.lascano@ars.usda.gov) for additional information.

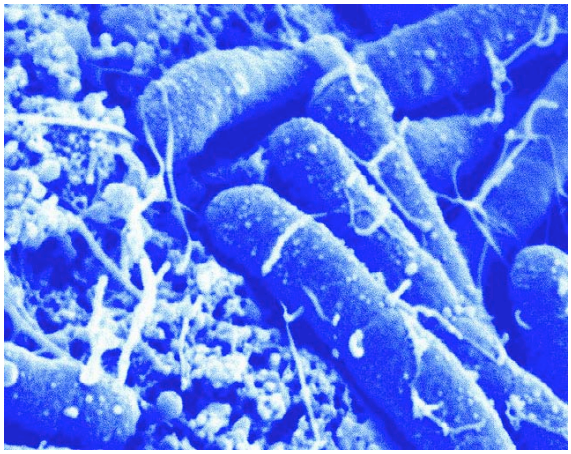


CRITICAL THRESHOLDS OF ERODIBLE SURFACES DETERMINED

Researchers at the Cropping Systems Research Laboratory employing two identical sampling systems, showed that it was possible to monitor the threshold of a highly mobile sand surface while simultaneously monitoring the threshold of a less mobile playa surface. Results indicate that threshold could be measured at both locations with enough precision to establish clear differences between the surfaces. The study revealed that a sand surface tends to maintain a somewhat consistent critical threshold for particle movement, while the threshold of a lakebed can vary more dramatically due to changing surface conditions. Contact Dr. John Stout (john.stout@ars.usda.gov) for additional information.

COTTON SEEDLING ABRASION AND RECOVERY FROM WIND BLOWN SAND

Research at the Cropping Systems Research Laboratory determined the effects of wind blown sand abrasion duration on cotton (*Gossypium hirsutum* L.) seedlings. The results indicate that, despite near-complete defoliation at the longest treatment duration of 40 min, cotton plants receiving this level of damage in the field may not require replanting. Contact Dr. Jeff Baker (jeff.baker@ars.usda.gov) for additional information.



SOIL MICROBIAL COMMUNITY STRUCTURE AND FUNCTIONALITY

Research at the Cropping Systems Research Laboratory identified changes in the soil microbial component affecting water availability and soil quality. The time needed to change the soil microbial component has been identified for integrated-livestock production systems and rotation of cotton with different crops such as sorghum, peanut, winter cover crops and/or corn. Soils under cotton based cropping systems (continuous cotton and cotton-cotton-peanut) showed lower microbial populations, mycorrhiza, and enzyme activities of C and P cycling compared to peanut based cropping systems (corn-peanut-cotton, peanut-peanut-cotton, and continuous peanut). These findings should be considered in the selection of cropping systems to maintain and/or improve soil quality, functionality, and sustainability of agricultural production. Contact Dr. Veronica Acosta-Martinez (veronica.acosta-martinez@ars.usda.gov) for additional information.

AIR QUALITY ISSUES RELATED TO AGRICULTURAL OPERATIONS AND PROCESSES

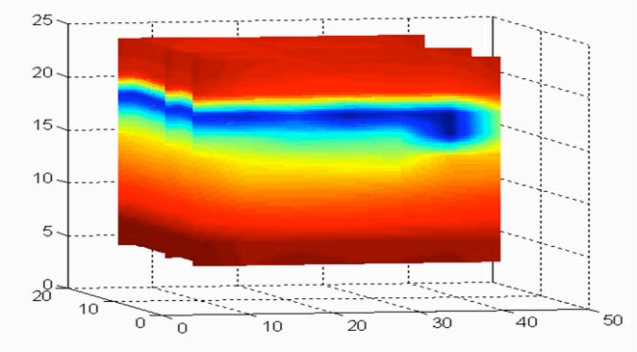
Research at the Cropping Systems Research Laboratory determines particulate matter emissions, pertaining to current federal and state regulatory agencies' guidelines, that can be expected from various related field and processing operations. These projects provide estimated emission reductions when alternative or additional abatement devices or best management practices are implemented. Contact Dr. Greg Holt (greg.holt@ars.usda.gov) for additional information.

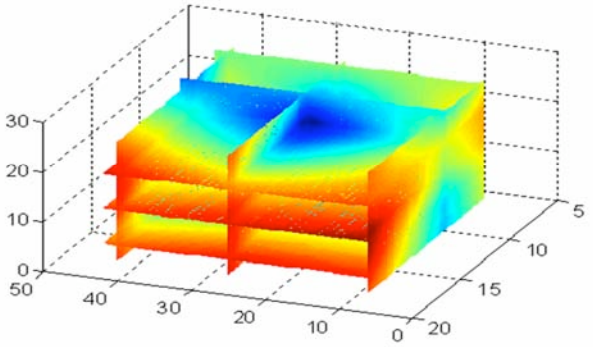
GIN TRASH TO GIN CASH

Scientists at the Cropping Systems Research Laboratory are developing processing methods for cotton gin byproducts that improve the market value, turning financial liabilities into viable marketable products. The development of a hydromulch from cotton byproducts was completed and the transfer of this technology resulted in the first commercial cotton-based hydromulch. Development of cotton gin byproduct fiber boards for construction is also under development. Contact Dr. Greg Holt (greg.holt@ars.usda.gov) for additional information.

MOISTURE MEASUREMENT SYSTEM FOR SEED COTTON OR LINT

Research at the Cropping Systems Research Laboratory resulted in a process for measuring the moisture content and the mass-moisture content of materials that requires no air reference or calibration sequence. A microwave signal is used to detect 3-dimensional moisture contents of cotton bales. Contact Dr. Matthew Pelletier (matthew.pelletier@ars.usda.gov) for additional information.



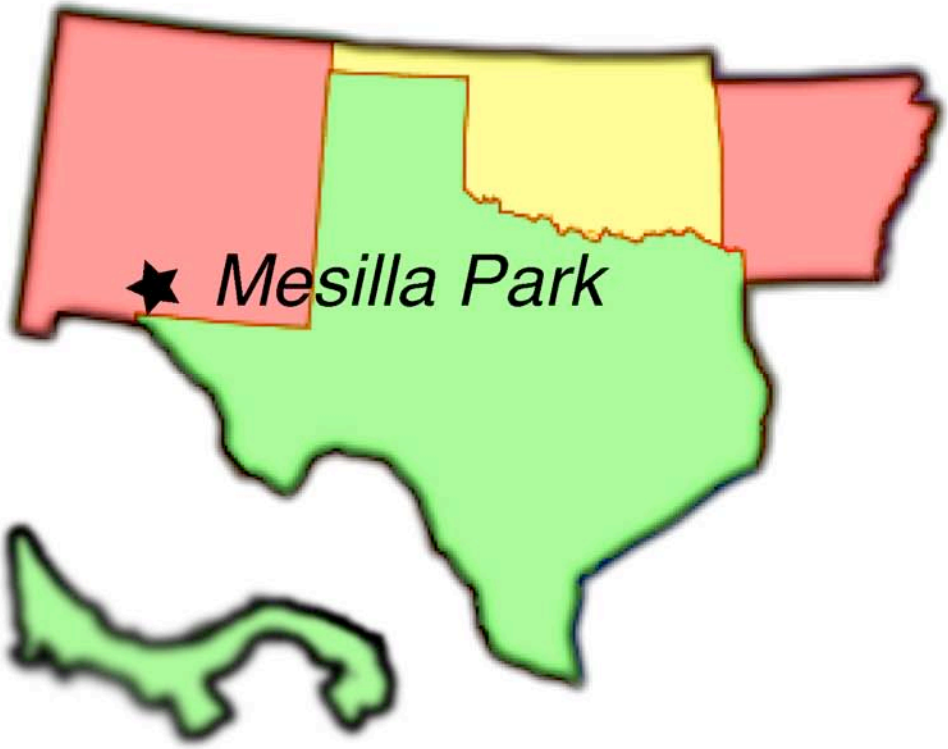


HARVESTING CLEANER COTTON

Scientists at the Cropping Systems Research Laboratory are developing handling and cleaning systems for cotton strippers that will improve the cleanliness and quality of seed cotton. Contact Dr. John Wanjura (john.wanjura@ars.usda.gov) for additional information.

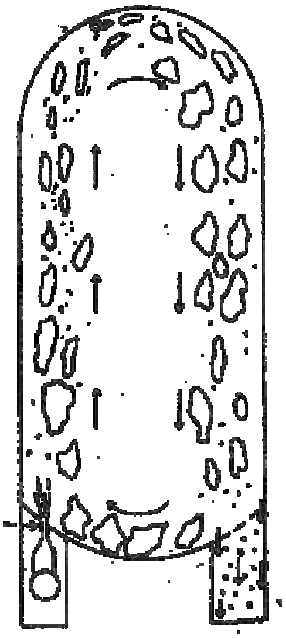
ENHANCING ANIMAL WELL-BEING, IMMUNOCOMPETENCE, AND PERFORMANCE

Research at the Cropping Systems Research Laboratory assesses the innate and adaptive immunity of cattle with various temperaments and genotypes to determine whether temperament and/or genotype can be linked immune function and subsequent productivity and well-being. Angus and Romosinuano cattle have been shown to differ in their ability to cope with immunological stress, and research has demonstrated that temperament is linked to both transportation stress and innate immune responses in cattle. Contact Dr. Jeff Carroll (jeff.carroll@ars.usda.gov) for additional information.


Mesilla Park

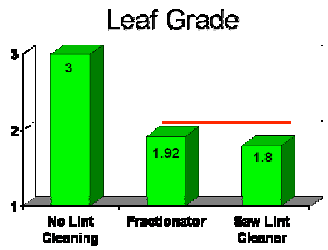
PREPARING COTTON FOR HARVEST WITHOUT USING CHEMICALS

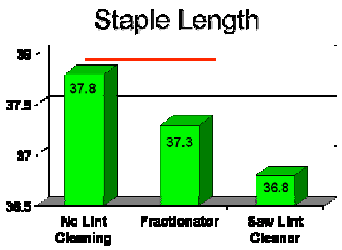
The Southwestern Cotton Ginning Research Laboratory developed technology to prepare cotton for harvest without using chemicals. It gives producers greater control over harvest timing, is effective in all weather, kills insect pests but is safe to apply near populated areas and sensitive crops. Certified for organic production, thermal defoliation also helps in conventional cropping systems; because cotton can be harvested within 24 hours of treatment, it is possible to avoid losses from predicted storm events. Contact Dr Paul Funk (paul.funk@ars.usda.gov) for additional information.

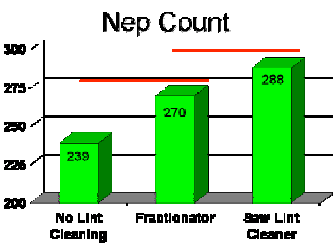


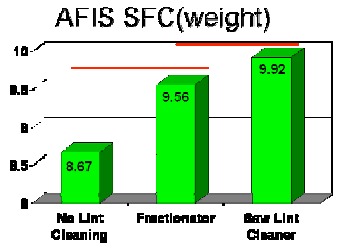
CLEANING COTTON LINT WITH AIR TO REDUCE FIBER DAMAGE

The Southwest Cotton Ginning Research Laboratory evaluated a pneumatic fractionator, long used to determine foreign matter content of seed cotton, as a lint cleaning device. The fractionator cleaned lint and produced color measurements similar to a saw-type lint cleaner, but maintaining fiber quality parameters such as length, short fiber content, and nep count at levels similar to those of lint not cleaned with the standard saw-type cleaner used in cotton gins. Contact Derek Whitelock (derek.whitelock@ars.usda.gov) for more information.



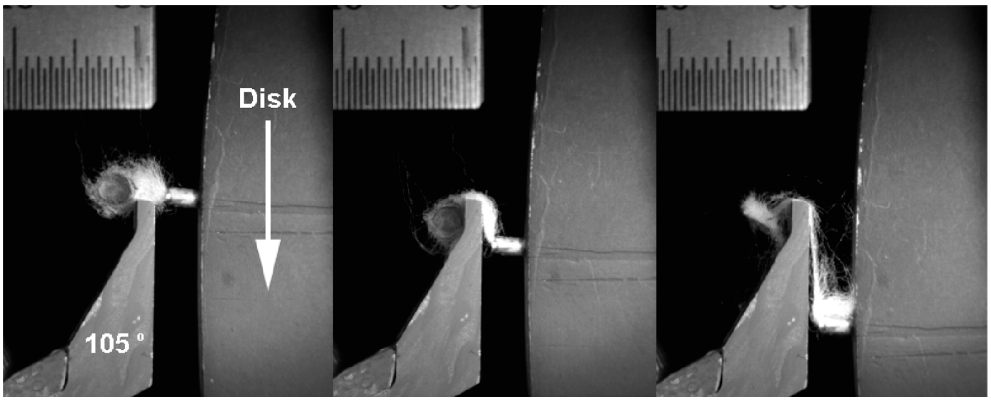






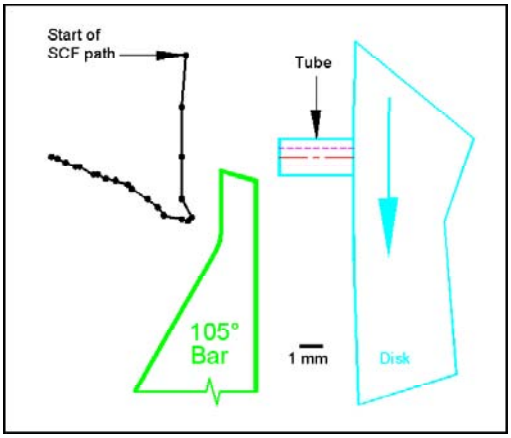
MOISTURE ADDITION TO COTTON LINT

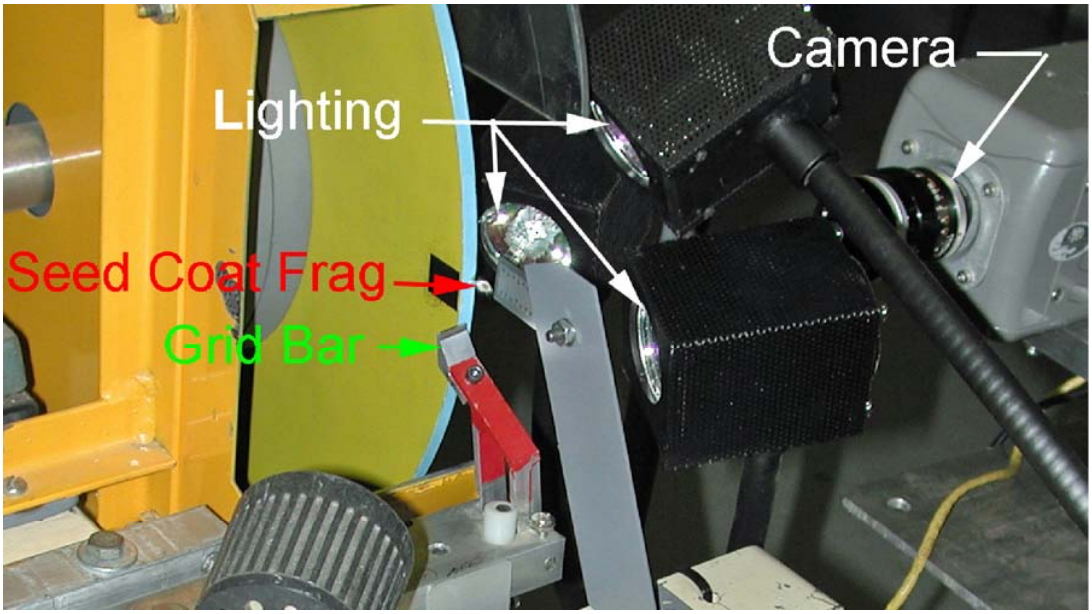
In order to increase profitability, cotton producers and ginners are interested in adding moisture to cotton lint as it is packaged into bales after ginning. Systems which use steam to add moisture have been used for many years. Recently, systems which spray a water mist have been marketed for adding moisture to cotton lint. A concern has arisen among the cotton textile industry about the storability of cotton bales that have had moisture added. Certainly, there is a level at which the added moisture will result in microbial growth that can affect the lint color. Steam systems are limited in the amount of moisture that can be added, and color changes have not been a problem to date. The new spray systems are capable of adding many times more water than a steam system, and some problems have been noted. Based upon our research, the National Cotton Council developed a standard requiring that the cotton moisture be less than 7.5% when a bale is formed. Adherence to this standard will avoid thousands of dollars of lost value to the cotton industry. The USDA, Farm Service Agency has used these results to withhold farm loan status for bales with moisture of 7.5% or greater. Contact Kevin Baker (kevin.baker @ars.usda.gov) for additional information.

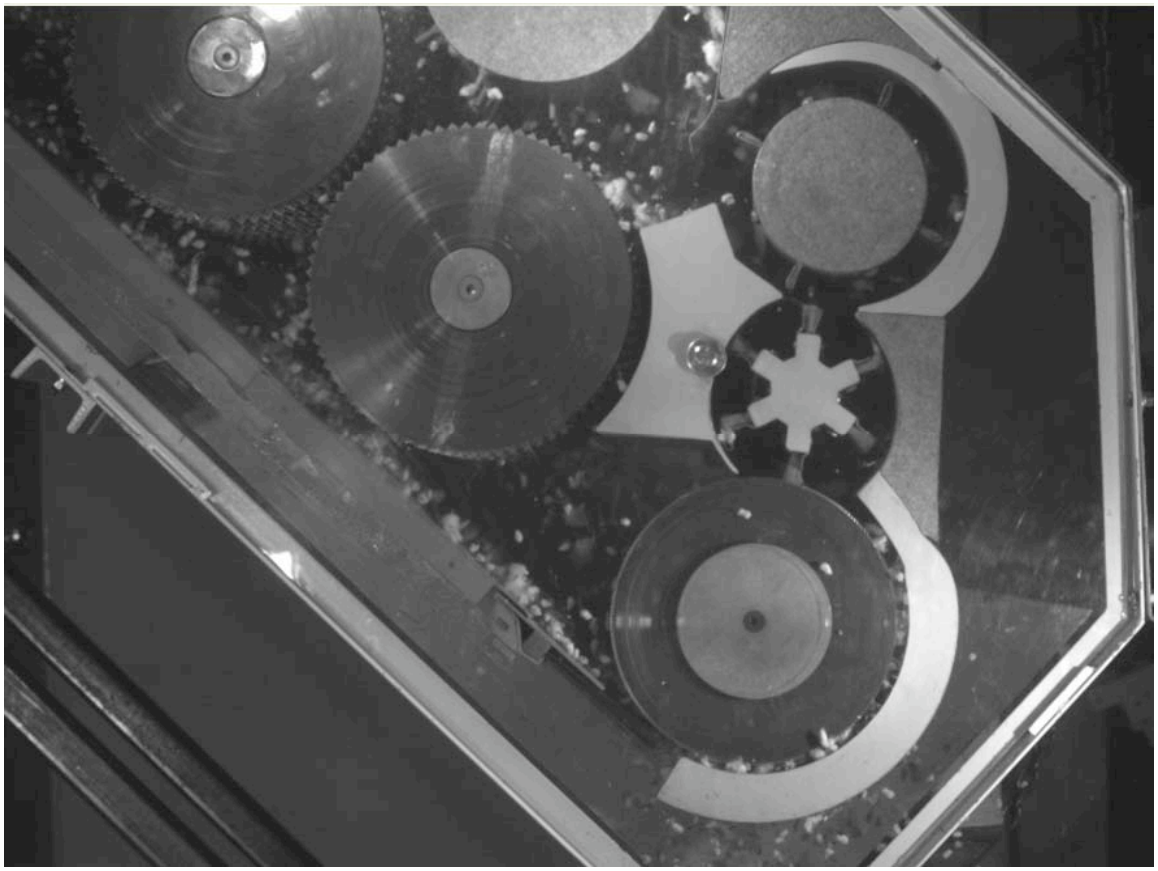


CHARTING THE COLLISION BETWEEN A SEED COAT FRAGMENT AND NEWLY-DESIGNED LINT CLEANER GRID BARS

Research at the Southwestern Cotton Ginning Research Laboratory, in collaboration with Cotton Incorporated, evaluated how a seed coat fragment reacts after colliding with model-size experimental grid bars mounted on a lint cleaner simulator. A high-speed digital video camera recorded the collision. Grid bar designs that showed potential for removing a seed coat fragment will be built and tested on a full-size lint cleaner. Contact Mr. Carlos Armijo (carlos.armijo@ars.usda.gov) for more information.

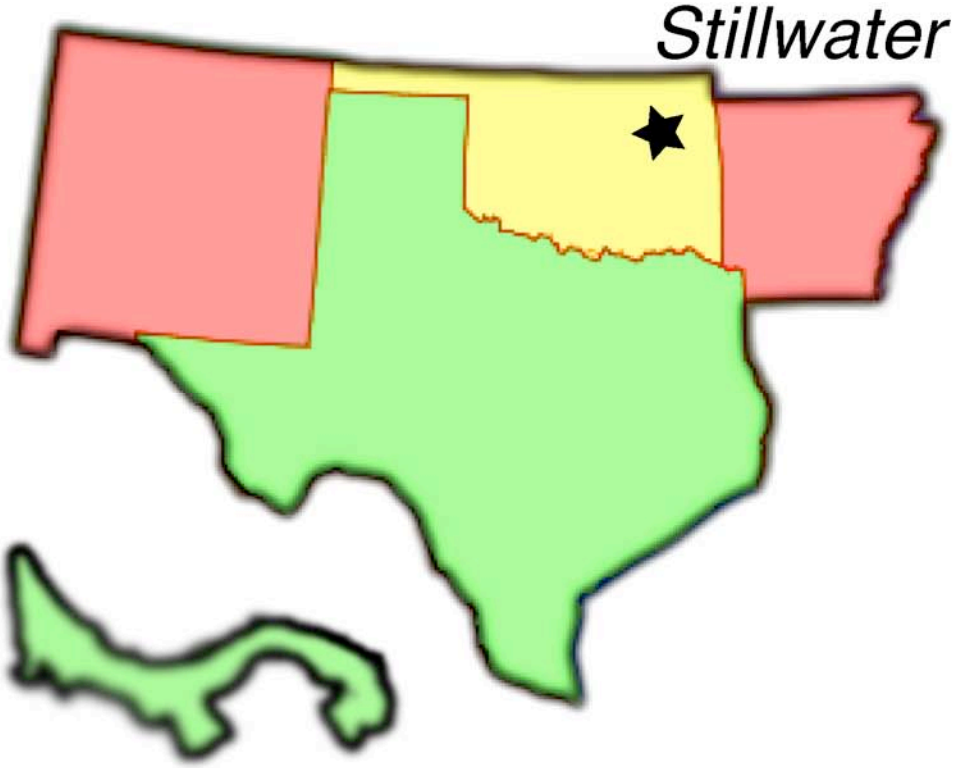






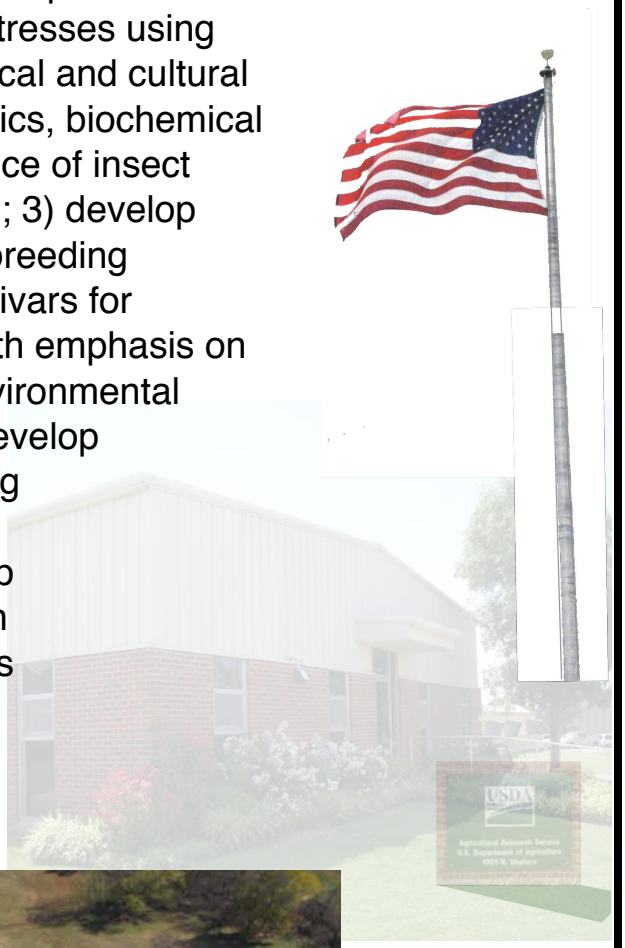
HIGH SPEED ROLLER GIN SEED-COTTON RECLAIMER

During the roller ginning process there is always a small percentage of seed cotton that is not processed and passes through with the ginned cottonseed. This unginned seed cotton in the cottonseed stream is called carryover and must be reclaimed and passed back to the gin stand. With the advent of high-speed roller ginning of upland cotton, the amount of seed-cotton carryover has increased over previous levels and an improved seed-cotton reclaimer is needed. An impact cleaner is a standard piece of seed-cotton cleaning equipment used before the gin stand to remove fine trash and was designed to handle high flow rates of seed cotton. An impact cleaner was modified to be used as a reclaimer for the higher flow rates resulting from high-speed roller ginning. High speed videos (500 frames per second) were used to make stop action observations of various parts of the reclaimer to guide initial design changes. Once the initial phase design/experimentation is complete, the reclaimer will be installed in the USDA, ARS, Southwestern Cotton Ginning Research Laboratory roller ginning line for more extensive testing. Contact Sidney E. Hughs (ed.hughs@ars.usda.gov) for more information.


Stillwater

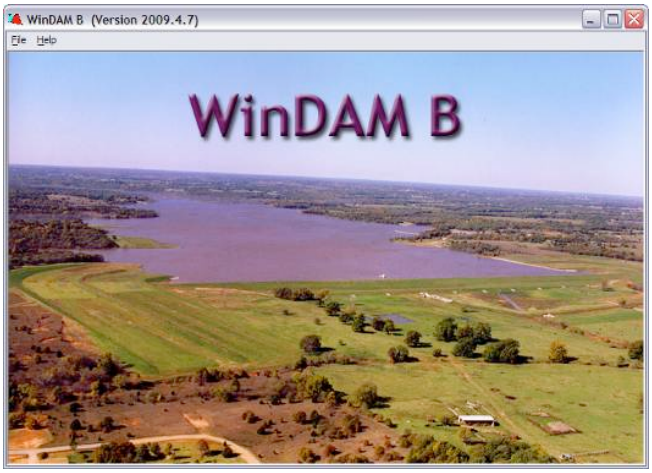
MISSION STATEMENT

The mission of the Wheat, Peanut and Other Field Crops Research Unit is to: 1) develop wheat, barley, and sorghum germplasm with inherent protection against insects and environmental stresses using genetic techniques; 2) define biological and cultural control methods, life histories, genetics, biochemical interactions, and economic importance of insect pests of wheat, barley, and sorghum; 3) develop basic peanut germplasm for use in breeding programs, and improved peanut cultivars for Southwest peanut-growing areas with emphasis on host plant resistance to disease, environmental stress, and nutritional qualities; 4) develop knowledge of mechanisms conveying resistance in peanut todiseases and environmental stress; and 5) develop knowledge and technology for use in improved crop management systems for the above mentioned crops.



PREDICTING EROSION FOR DAM SAFETY

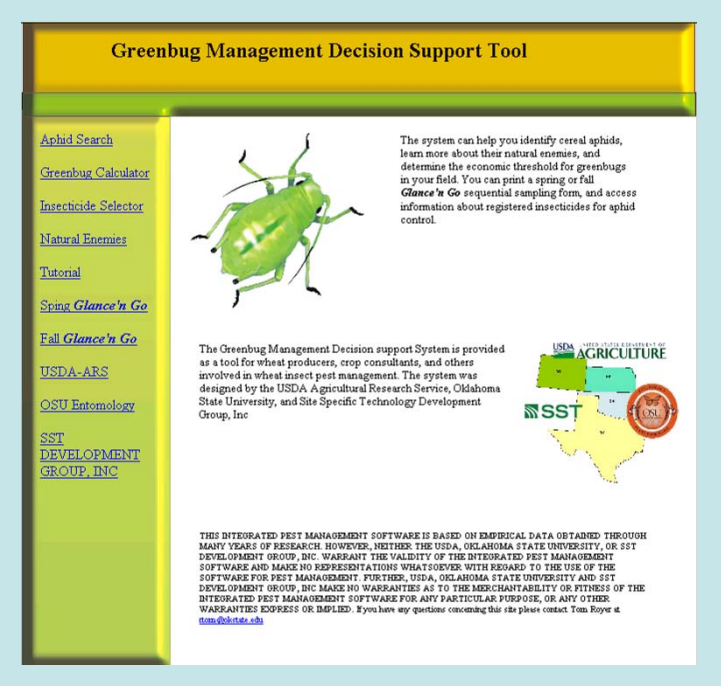
Research at the Hydraulic Engineering Research Unit in cooperation with the Natural Resources Conservation Service (NRCS) is providing the knowledge and tools needed to better understand and predict the performance of earth dams and spillways subjected hydraulic attack during major floods and incidents. ARS scientists continue to study and quantify the processes by which embankments resist hydraulic attack. This research has led to the development of an alpha test version of WINdows Dam Analysis Modules (WINDAMb) application software for use by engineers in the evaluation of the breach potential of existing dams. This tool will assist engineers in determining the best use of limited resources in maintaining public safety. Contact Dr. Gregory Hanson (greg.hanson@ars.usda.gov).



DAM REHABILITATION AND ROLLER COMPACTED CONCRETE SPILLWAYS

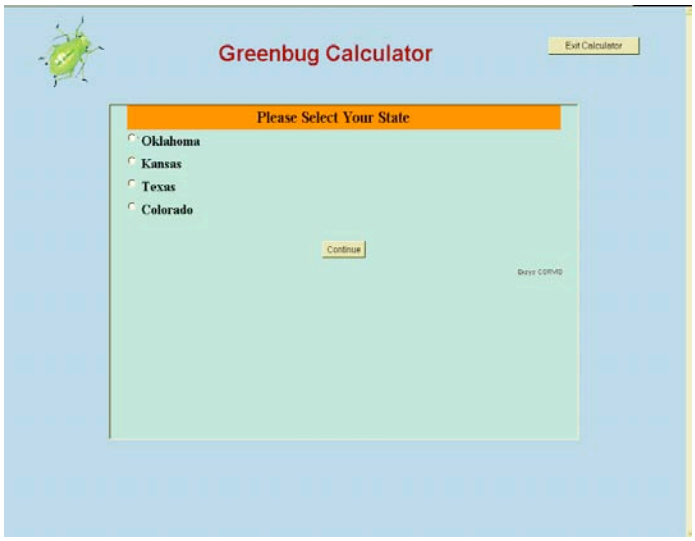
Research at the Hydraulic Engineering Research Unit in cooperation with the Natural Resources Conservation Service (NRCS) aims to improve criteria for utilizing roller compacted concrete (RCC) spillways over existing earth embankments to provide adequate spillway capacity for major flood events. Data from specific and generalized model studies are being analyzed and potential options for containing flow in converging spillways are being evaluated. The results of this research will provide design tools for optimum utilization of limited resources for spillways and associated stilling basins. Contact Dr. Sherry Hunt (sherry.hunt@ars.usda.gov) for additional information.

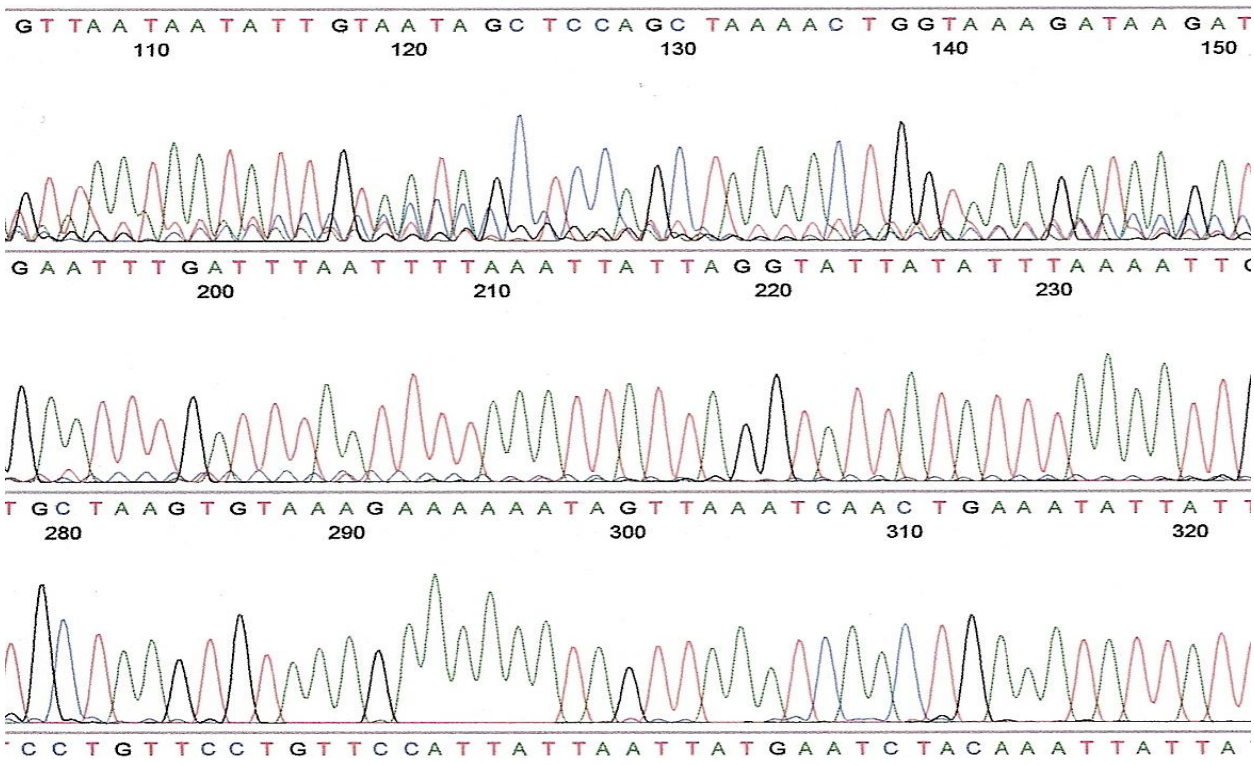
Researchers at the Wheat, Peanut and Other Field Crops Research Unit identify resistance to cereal aphids in barley by mass greenhouse screenings of barley collections. Identified resistant sources are then tested for field resistance and genetic studies are conducted to determine the genetic control of resistance in each line. Resistance genes are then transferred to cultivated barleys through traditional breeding practices. The best agronomic lines are selected for germplasm or cultivar release. Contact Dr. Do Mornhinweg (do.mornhinweg@ars.usda.gov) for additional information.



GREENBUG DECISION SUPPORT SYSTEM DEVELOPED

Research at the Plant Science Research Laboratory led to the development of the Greenbug Decision Support System, a computer based tool developed for the wheat industry to assist with greenbug pest management decision making. The greenbug is the most important insect pest of wheat in several Southern Plains states. The Decision Support System was developed to save wheat growers time and money when determining whether their wheat fields need to be treated with insecticide to control greenbugs. The software is currently available on-line for use by the general public at no cost. Contact Dr. Norman Elliott (norman.elliott@ars.usda.gov) for additional information.





RUSSIAN WHEAT APHID BIOTYPES: WHERE DID THEY COME FROM?

Research at the Wheat, Peanut and other Field Crops Research Unit in Stillwater, OK, discovered the most probable explanation for the rapid occurrence of the resistant wheat killing biotype that occurred in 1993. The biotype was found only after 5 years of commercial planting of resistant wheat, and in Colorado where most of the resistant wheat was planted. There was no genetic variation found between the biotype and the "normal" Russian wheat aphids across a wide geographic range from Texas to Wyoming. All Russian wheat aphids appeared to be genetically identical using molecular markers. The biotype most likely arose from the US population in the resistant wheat growing area, and was not introduced into the US from another country. Aphids are very sensitive to their environment and hosts, can adapt quickly, and then rapidly spread through their asexual reproduction. The exact biochemical and genetic factors that allow the biotype to kill resistant wheat are still not known. Contact Dr. Kevin A. Shufran (kevin.shufran@ars.usda.gov) for additional information.

ECOLOGICAL CHARACTERIZATION OF GREENBUG BIOTYPE

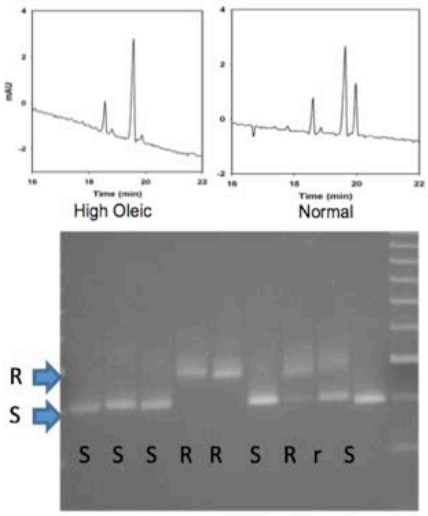
Research at the Wheat, Peanut and Other Field Crops Research Unit assessed the role of grass hosts associated with cereal crops in the population ecology of greenbugs and determined that biotypic diversity is not a result of selection pressure exerted by resistant crops. Instead, the greatest diversity and the most virulent biotypes occur on non-cultivated grass hosts, which are central to the development and maintenance of greenbug biotypes. These findings provide a basis for the development of regional prescriptions for grasses for use in NRCS buffer systems and CRP plantings. Contact Dr. John Burd (john.burd@ars.usda.gov) for additional information.

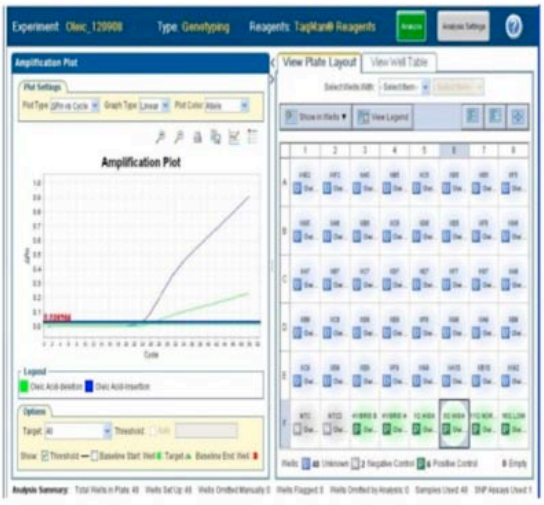
IMPROVE DISEASE RESISTANCE IN PEANUT

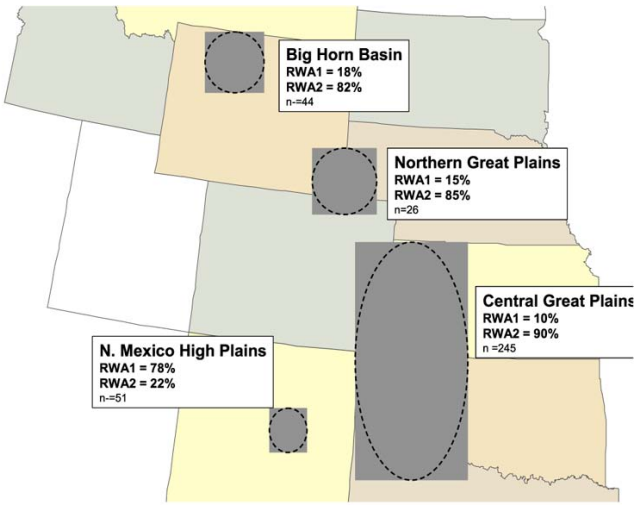
Research at the Wheat, Peanut and Other Field Crops Research Unit in Stillwater, Oklahoma, is to enhance disease resistance and oil quality attributes of peanut. Disease evaluations under greenhouse and laboratory are carried throughout the year. Therefore, developing reliable disease screening techniques is of prime importance to accelerate the breeding program and to provide basic information on host pathogen interactions. One of the most destructive diseases on peanut is Sclerotinia blight. We have developed a method to reproduce this blight and quantify the reaction under controlled conditions. Whole peanut plants or detached shoots are inoculated with a 2-day-old culture, and incubated at 100% relative humidity in a fabricated polyethylene chamber. Using this technique over the last twenty five years was successful in accelerating our breeding efforts in identifying resistant sources and producing several cultivars with acceptable resistant to Sclerotinia blight. Contact Dr. Hassan A. Melouk (hassan.melouk@okstate.edu or hassan.melouk@ars.usda.gov) for additional information.

BIOTECHNOLOGY INCREASES EFFICIENCY OF PEANUT

Researchers at the Wheat, Peanut and Other Field Crops Research Unit in Stillwater, Oklahoma, use biotechnology to decrease the amount of time required to produce improved peanut germplasm and release it for commercial production. They have identified the only molecular maker associated with Sclerotinia blight, a fungal disease of peanut that results in profit loss to producers in the Southwest US every growing season. They use this marker to speed up disease resistance screening of peanut breeding lines and to identify new sources of resistance in germplasm collections. These researchers also use capillary electrophoresis and real time PCR to characterize the oil composition of individual peanut seeds, rapidly identifying those with high oleic acid content, a trait which extends the shelf life of peanut products. Their use of biotechnology to aid traditional breeding practices will trim at least 5 years off the time required to release new peanut cultivars. Contact Dr. Kelly D. Chamberlin (kelly.chamberlin@ars.usda.gov) for additional information.





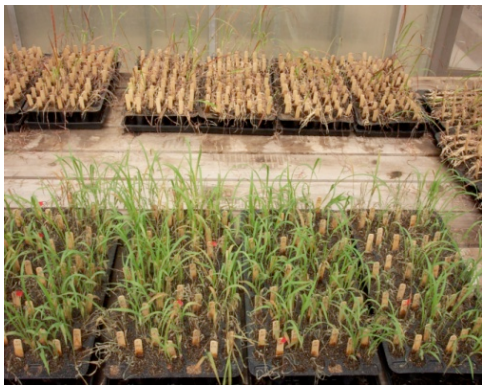


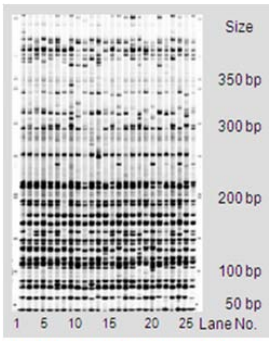
ECOLOGY AND BIOTYPIC DIVERSITY OF RUSSIAN WHEAT APHID

Research at the Wheat, Peanut and Other Field Crops Research Unit on Russian Wheat Aphid (RWA) biotype occurrence, distribution, and ecology provides critical information that assists government and state wheat and barley breeders develop varieties with genetic resistance that will lead to sustainable aphid pest management without the use of insecticides. Studies show that the new RWA biotype that overcame previously resistant wheat now dominates the primary hard red winter wheat growing region of the USA. This shift in biotype composition ended 10 years of successful insecticide free management of RWA with resistant wheat. Areas of biotypic diversity have been located which will enable the identification of new genes resistant to the entire RWA population and prevent RWA biotype development. Contact Dr. Gary Puterka (gary.puterka@ars.usda.gov) for additional information.

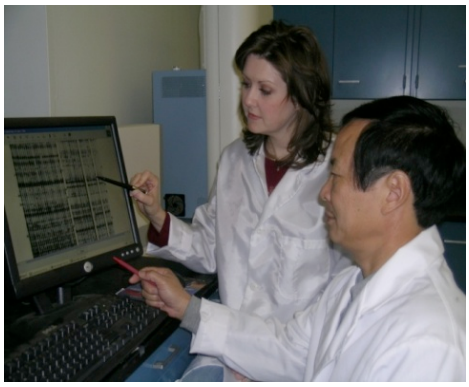
Table: Virulence profiles of fundatricies collected from wheat and grasses at a specific site in Montezuma Co., Colorado, Spring 2007

Biotype	Obs	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16
	2	A	A	A	A	A	A	A	A	A	A	A	A	V	A	A	V
	1	A	A	A	A	A	A	A	A	V	A	A	A	V	A	A	V
	2	A	A	A	A	A	A	A	V	A	A	A	V	V	A	A	V
RWA1	2	A	A	A	A	A	A	A	V	V	A	A	V	V	A	A	A
	3	A	A	A	A	A	A	A	V	V	A	A	V	V	A	A	V
	1	A	A	A	A	A	V	A	V	A	A	A	A	V	A	A	V
	1	A	A	A	V	A	A	A	V	V	A	A	V	V	A	A	V
	4	A	A	V	A	A	A	A	A	A	A	A	V	V	A	A	V
	1	A	A	V	A	A	A	A	A	V	A	A	V	V	A	A	V
	7	A	A	V	A	A	A	A	V	A	A	A	V	A	A	A	A
	19	A	A	V	A	A	A	A	V	V	A	A	V	V	A	A	V
	2	A	A	V	A	A	V	A	V	V	A	A	V	V	A	A	V
	1	A	A	V	A	V	A	A	A	A	A	A	V	V	A	A	V
RWA6	1	A	A	V	A	V	A	A	V	V	A	A	V	V	A	A	V
	1	A	A	V	A	V	A	A	V	V	A	A	V	V	A	A	V
	1	A	A	V	V	A	A	A	A	V	A	A	V	V	A	A	V
	1	A	A	V	V	A	A	A	V	V	A	A	V	V	A	A	V
	1	A	A	V	V	A	A	A	V	V	A	A	V	V	A	A	V
	1	A	V	A	A	A	A	A	A	A	A	A	V	V	A	A	V
RWA8	1	A	V	A	A	A	A	A	V	A	A	A	V	V	A	A	V



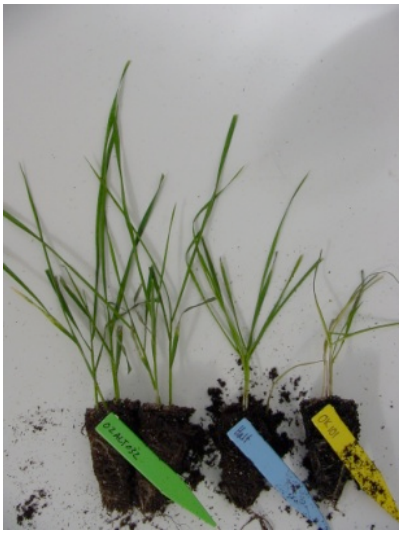


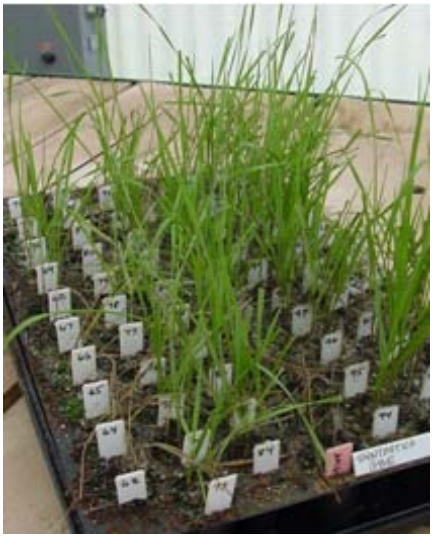
Analysis genetic diversity of sorghum germplasm using DNA markers



DEVELOPMENT OF SORGHUM FOR GREENBUG RESISTANCE AND AS FEEDSTOCK FOR BIOFUEL

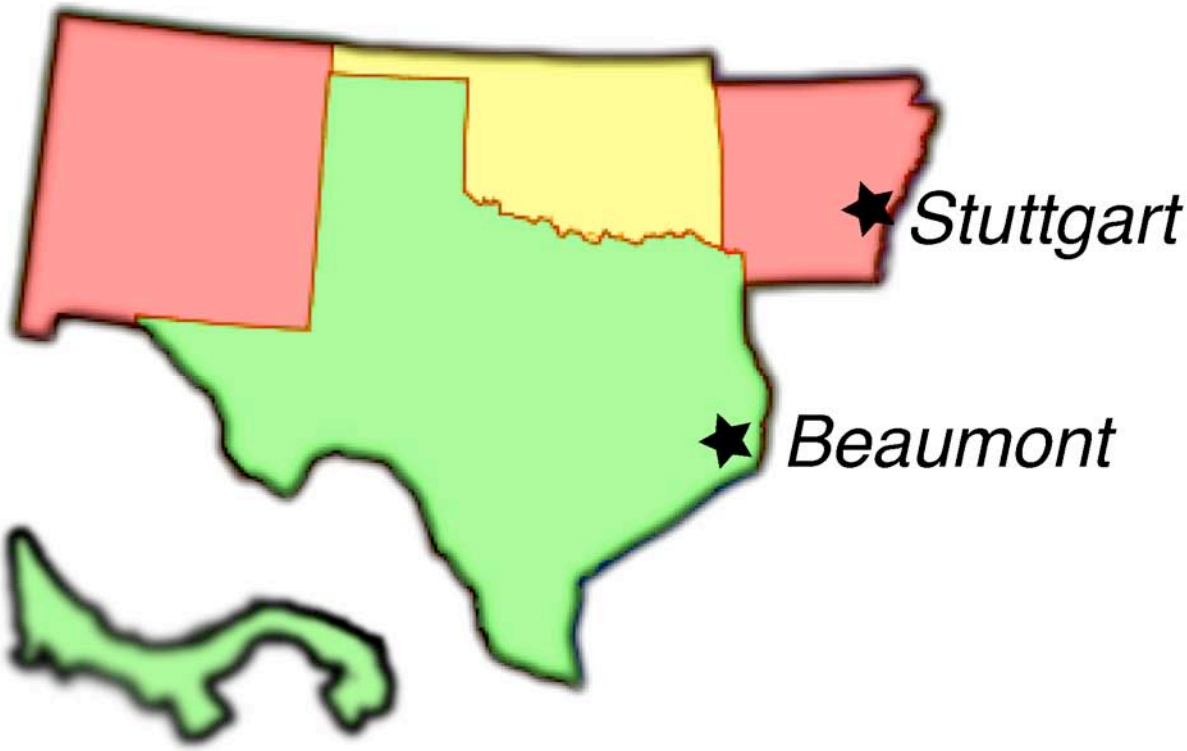
Researchers at the Wheat, Peanut and Other Field Crops Research Unit in Stillwater, OK, identified new sources of greenbug resistance in sorghum. Their current research focuses on characterization of the resistance mechanisms and transfer of the novel greenbug resistance into elite sorghum varieties and cultivars through traditional breeding and/or biotechnological approaches. Additional work is directed at genetic improvement of sorghum, including sweet sorghum and biomass sorghum, as feedstocks for bioethanol production. Contact Dr. Yinghua Huang (yinghua.huang@ars.usda.gov) for additional information.





DEVELOPMENT OF WHEAT RESISTANT TO RUSSIAN WHEAT APHID AND GREENBUG

Research at the Wheat, Peanut and Other Field Crops Research Unit in Stillwater, OK, in collaboration with Oklahoma State University, has resulted in the development of agronomically adapted wheat germplasm lines that are highly resistant to Russian Wheat Aphid (RWA) and greenbug. Their research continues to evaluate additional sources for aphid resistance as the pest populations can continue to change over time, so it is important to have wheat varieties available that are resistant to multiple cereal aphid species or biotypes. Contact Dr. Yinghua Huang (yinghua.huang@ars.usda.gov) for additional information.


Stuttgart
Beaumont

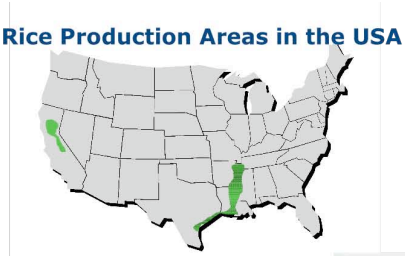
USDA ARS

Dale Bumpers National Rice Research Center
Stuttgart, Arkansas

Rice Research Unit
Beaumont, TX

TWO RESEARCH CENTERS, *ONE MISSION*

The Dale Bumpers National Rice Research Center in Stuttgart, Arkansas and the Rice Research Unit in Beaumont, Texas are part of a coordinated research program to develop new knowledge, technology, and genetic resources that will benefit the U.S. rice industry through higher yield, better quality, and enhanced resistance to abiotic and biotic stresses. The research mission is part of National Program 301 – Plant Genetic Resources, Genomics, and Genetic Improvement, which addresses the ARS Strategic Goal 2 – Enhance the Competitiveness of Rural and Farm Economies. Scientists at these centers have expertise in genetics, genomics, cytogenetics, cereal chemistry, plant physiology, plant pathology, and molecular biology. The two centers are co-located on research stations operated by the University of Arkansas and Texas AgriLife Research. In addition, research collaborations are underway with some 30 other ARS research programs, universities, and international research institutions.



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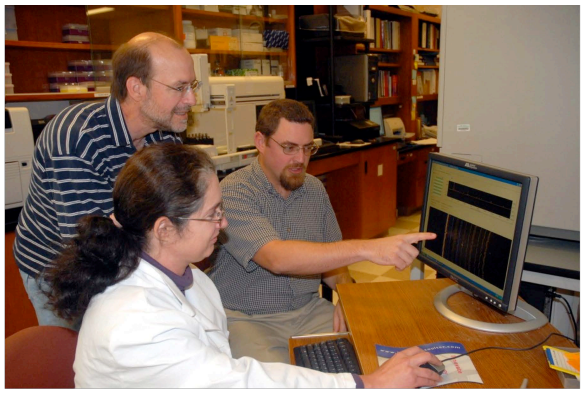
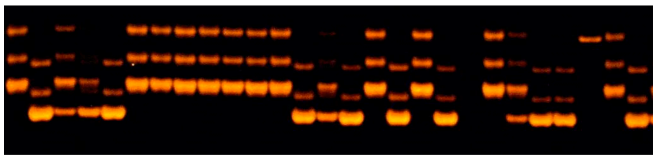
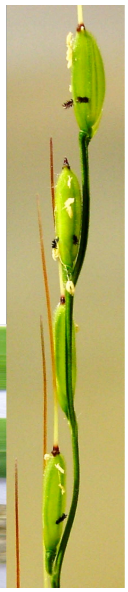




GENOMIC DISCOVERY OF IMPORTANT GENES IN RICE

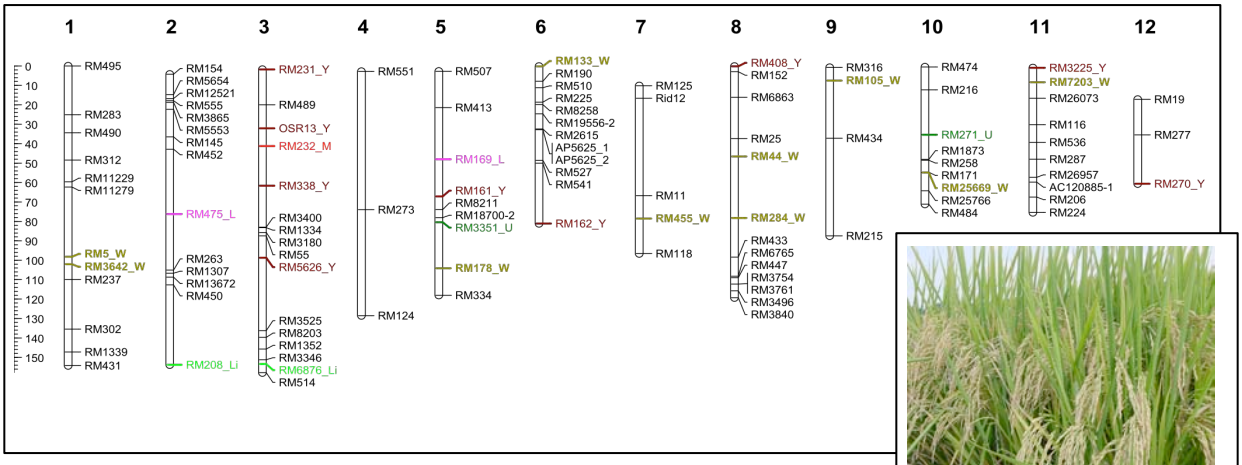
The Applied Genomics Facility provides cutting edge genomics and bioinformatics analysis to facilitate the research of scientists and collaborators of the Dale Bumpers National Rice Research Center and the Rice Research Unit. Our goal is to combine both basic research and applied knowledge to provide powerful tools to better understand and utilize the natural genetic diversity that exists in rice. One of the main functions is generating high-throughput molecular marker data and assisting in its analysis for a wide range of projects. Recent projects have included examining mapping populations for genes involved in disease resistance and milling quality, association mapping studies involving the world's diverse rice germplasm collection, and marker assisted selection to rapidly incorporate desirable traits such as aroma, cooking quality, and disease resistance into elite cultivars. Contact Dr. Bob Fjellstrom (bob.fjellstrom@ars.usda.gov) for additional information.



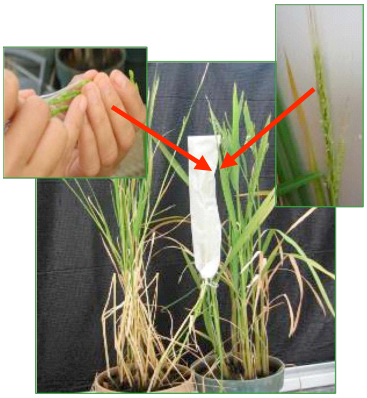
EXPLORING THE WORLD COLLECTION OF RICE FOR VALUABLE GENES

Researchers at the Dale Bumpers National Rice Research Center comprehensively described the USDA world collection of rice germplasm for genomic diversity and 26 plant characteristics, and produced viable seeds for distribution to rice researchers around the world. Recently, rice accessions have been identified harboring new genes for straighthead and blast resistances, and stigma exsertion, a trait important for hybrid seed production. Rondo is a new cultivar that has been developed from one of these accessions using mutation breeding that possesses outstanding resistance to fungal diseases and superior parboiling quality. Contact Dr. WenGui Yan (wengui.yan@ars.usda.gov) for additional information.

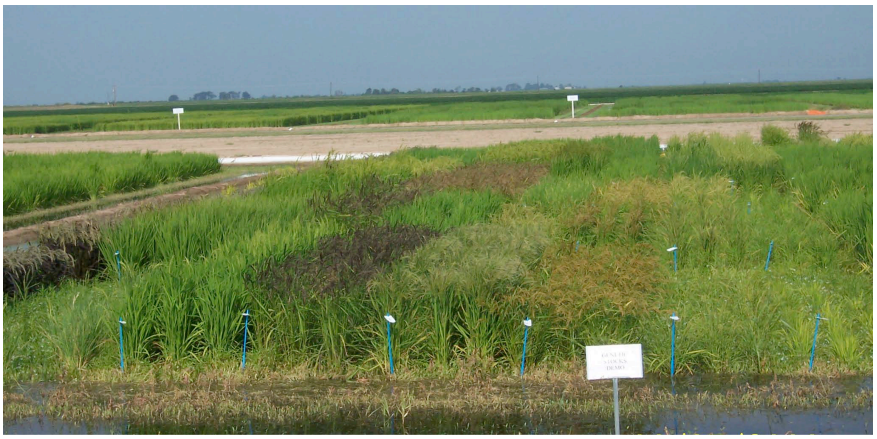
Genetic Map of Twelve Rice Chromosomes



REDISCOVERING "LOST GENES" IN RICE WILD RELATIVES



Research at the Dale Bumpers National Rice Research Center identified resistance to the rice diseases sheath blight and blast in rice ancestral species that are closely related to cultivated rice (*Oryza sativa*). Novel sheath blight resistance genes were discovered in a few accessions of the wild progenitor *Oryza nivara* and are being re-introduced into rice cultivars adapted for production in the U.S. through a crossing program. Research conducted in collaboration with Cornell University has identified chromosomal regions derived from the wild progenitor, *Oryza rufipogon*, that result in a 20% increase in yield when crossed into a U.S. long grain cultivar. Contact Dr. Georgia Eizenga (georgia.eizenga@ars.usda.gov) for additional information.



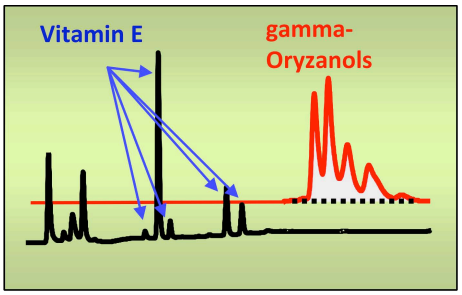
VALUABLE GENETIC RESOURCES ARE PRESERVED AND DISTRIBUTED

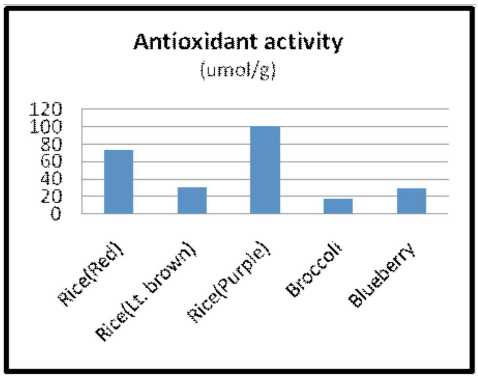
The USDA Genetic Stocks-Oryza (GSOR) Collection at the Dale Bumpers National Rice Research Center serves as distribution center for genetic mutants and molecularly characterized genetic resources of rice that are important to the research community. Some 26,000 accessions are currently available free of charge to researchers worldwide. The collection expands each year as U.S. researchers develop new resources useful for genetic and genomic studies. In addition, the Japanese cultivar Nipponbare is available through the GSOR. Nipponbare was the first rice cultivar to be completely sequenced by the International Rice Genome Sequencing Project in 2005. Nipponbare is used by researchers as a baseline for DNA comparison with other rice varieties to identify genes that control economically important traits. The collection is described at the GSOR website http://www.ars.usda.gov//Main/site_main.htm?docid=8318 .

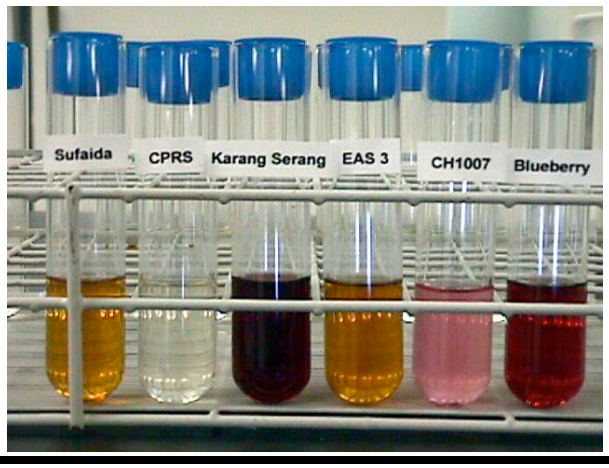


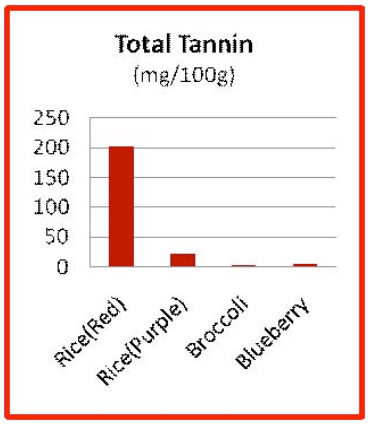
HEALTH-BENEFICIAL PHYTONUTRIENTS IN WHOLE-GRAIN RICE ARE IDENTIFIED

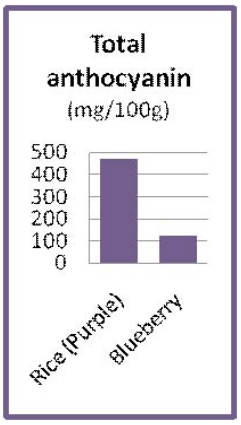
Researchers at the Rice Research Unit have been studying the health-beneficial phytonutrients in whole-grain rice, such as vitamin E, gamma-oryzanols and polyphenols (tannins, anthocyanins, and simple phenolics). These phytonutrients are antioxidants and are associated with reduced risk of developing chronic diseases, such as cancer and cardiovascular diseases. The research focuses on identifying phytonutrients in rice, determining the concentrations of these phytonutrients in whole- grain rice of different bran colors in comparison with those of fruits and vegetables, and determining the genetic diversity of these compounds in the rice germplasm collection. The goal is to develop healthier rice for consumption as a whole grain or as a source of health-beneficial ingredients. Contact Dr. Ming-Hsuan Chen (ming.chen@ars.usda.gov) for additional information.





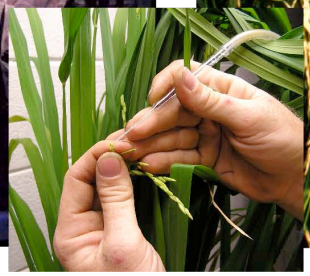






NEW RICE CULTIVARS ARE DEVELOPED FOR CONVENTIONAL AND SPECIALTY MARKETS

Research conducted at the Dale Bumpers National Rice Research Center and the Rice Research Unit has led to the development of several new rice cultivars that are being grown commercially in the southern U.S. These have been developed using traditional crossing techniques or mutation breeding. Genetic markers linked to various grain quality traits and disease resistance genes have facilitated the development of these cultivars. Pure seed of these cultivars is provided to state run foundation seed programs that then increase for commercialization to farmers. Contact Anna McClung (anna.mcclung@ars.usda.gov) for additional information.



EARLY TILLERING INCREASES RICE YIELD AND QUALITY

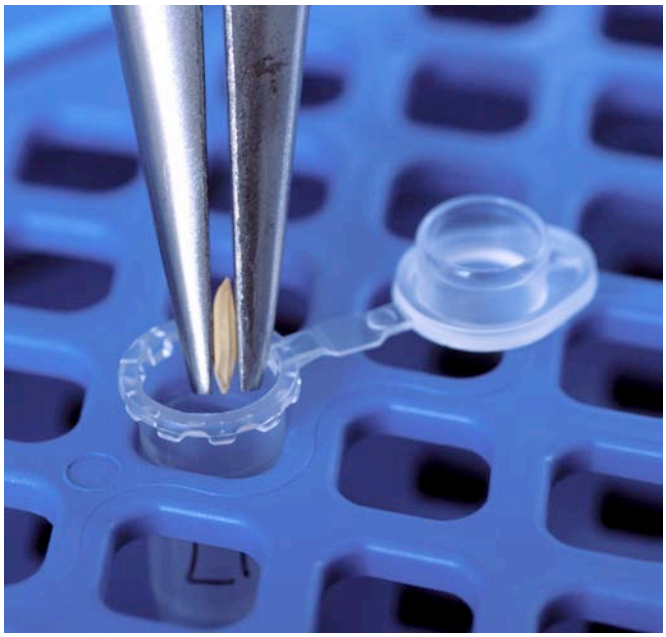
The more stems, or tillers, a rice plant produces, the more grain-bearing panicles are formed, resulting in higher rice yields. Tillers that are produced early in the plant growth process produce larger panicles, further increasing yield potential. They are also synchronized in maturity with the panicle on the first, or main stem. Synchronized maturity between panicles improves the milling quality of the resulting rice harvest, which improves income for both farmers and millers. Early tiller production also allows the rice plants to 'lock in' their yield potential before the plants face stress from root-feeding insects, drought, or weed competition. Researchers at the Rice Research Unit have identified several high-tillering genes within a cultivar from China, and are developing molecular markers linked to these genes so that breeders can use marker-assisted techniques to develop improved U.S. varieties. New knowledge on the physiological and biochemical mechanisms that control the timing of tiller production within young rice plants is being pursued with the goal of creating U.S. rice varieties with highly synchronized tiller and panicle production. Contact Dr. Shannon Pinson (shannon.pinson@ars.usda.gov) for additional information.

RICE THAT GERMINATES UNDER COOL TEMPERATURES

Researchers at the Dale Bumpers National Rice Research Center, in collaboration with University of Arkansas scientists, identified genetic strains of rice that have the ability to germinate under cool temperatures. Genetic markers that are linked to cool temperature germination will be verified and will be ultimately used by breeders to develop new rice cultivars that can be planted earlier in the season, reducing herbicide usage and season-long irrigation costs. Contact Dr. Helen Miller (helen.miller@ars.usda.gov) for additional information.

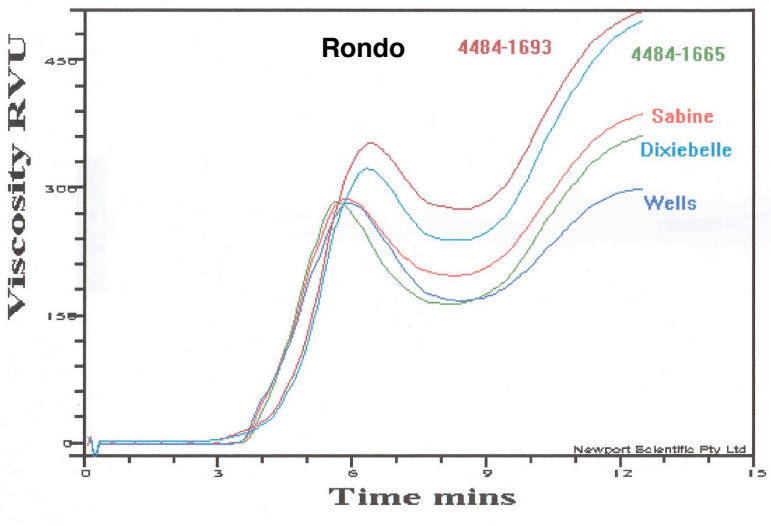
THE SEARCH FOR RESISTANCE TO GRAIN SMUTS IN RICE

Researchers at the Dale Bumpers National Rice Research Center and the University of Arkansas Rice Research and Extension Center are searching for rice varieties and germplasm accessions that are resistant to false smut and kernel smut. Most rice varieties grown in the southern U.S. are smut susceptible, and development of resistance is a critical component of a successful disease control strategy. Researchers have identified three sources of kernel smut resistance in modern rice varieties and have also identified promising sources of false smut resistance. They have also developed strategies to mitigate disease severity on susceptible rice through conservation tillage, crop rotation, and upland irrigation. Contact Dr. Steven Brooks (steven.brooks@ars.usda.gov) for additional information.



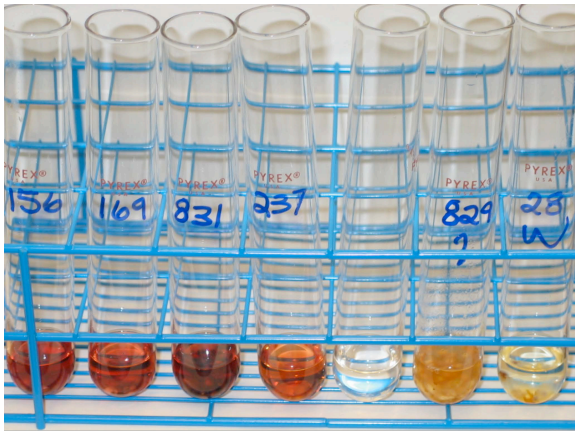
COOKING AND PROCESSING QUALITY OF RICE IS DETERMINED

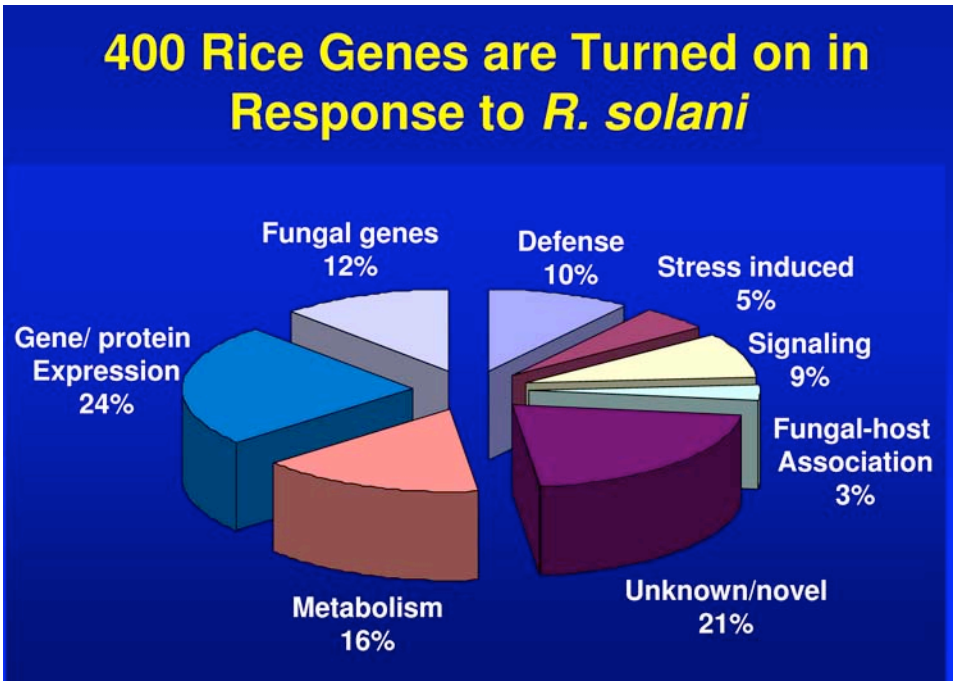
Research at the Dale Bumpers National Rice Research Center uses state-of-the-art instrumentation (Gas Chromatography/Mass Spectrometry, AutoAnalyzer, Rapid Visco Analyzer, etc) to determine the presence of compounds that affect texture and flavor of rice. Amylose is a component of grain starch that largely determines cooked rice texture. Lipid and protein contents and 2-acetyl-1-pyrroline, the compound that gives aromatic rice its popcorn-like flavor, are other factors affecting rice flavor. This research is used to assist breeders in developing new rice cultivars that meet the high quality standards that are expected by millers, processors, and consumers. Contact Dr. Rolfe Bryant (rolfe.bryant@ars.usda.gov) for additional information.



NEW METHODS TO CONTROL WEEDY RED RICE IN RICE PRODUCTION FIELDS

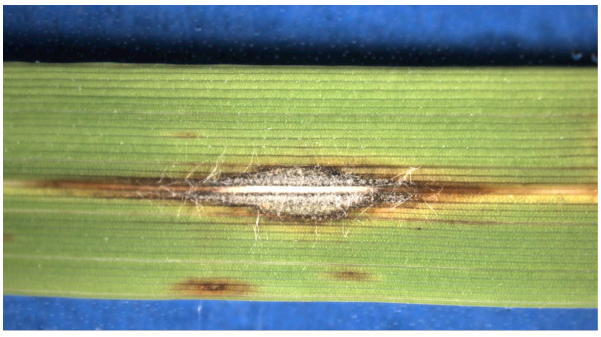
A weedy version of cultivated rice called red rice is a scourge to the rice industry because of its ability to lie dormant in the soil for years, its ultra-competitive growth, diverse biology, undesirable red seed color, and, because it is genetically similar to cultivated rice, can not be controlled using traditional herbicides. Because red rice can outcross with herbicide-resistant rice varieties, the longevity of this powerful new weed control tool is threatened. Researchers at the Dale Bumpers National Rice Research Center have used DNA fingerprinting to determine the degree of outcrossing between rice and red rice, to assess which varieties and cultural practices are best suited to avert this problem. Contact Dr. David Gealy (david.gealy@ars.usda.gov) for more information.

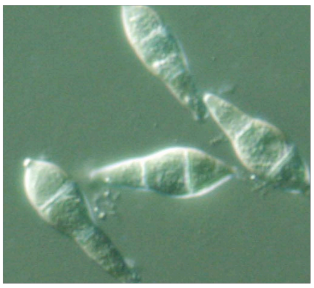




MECHANISMS OF HOST-PATHOGEN INTERACTION IDENTIFIED FOR THE CONTROL OF RICE DISEASES

Researchers at the Dale Bumpers National Rice Research Center identified genetic and molecular interaction mechanisms for the two most destructive fungal diseases of rice: blast fungus *Magnaporthe oryzae* and sheath blight fungus *Rhizoctonia solani*. The studies characterized genetic resources, interaction mechanisms, and distribution and evolution of resistance genes, and have resulted in the development of molecular and pathological tools, improved breeding lines, and genetic stocks for the control of rice diseases. Contact Dr. Yulin Jia (yulin.jia@ars.usda.gov) for additional information.





H.K. Dupree Stuttgart National Aquaculture Research Center

Stuttgart, AR & Ft. Pierce, FL

MISSION STATEMENT OF THE H.K. DUPREE STUTTGART NATIONAL AQUACULTURE RESEARCH CENTER

The mission of the Harry K. Dupree Stuttgart National Aquaculture Research Center is to conduct aquaculture research to address the highest priority needs of the U.S. aquacultureindustry. The Center's research program is composed of in-house research projects in both Stuttgart, AR and Fort Pierce, FL. The Center's research programs focus primarily in three areas: 1) Freshwater Systems Production Research, including development of feeds and improved culture strategies for warmwater fish species, such as hybrid striped bass, channel catfish, and hybrid catfish; 2) Marine Systems Production Research including development of feeds, improved recirculating production systems, and larval culture strategies for sustainable production of marine species such as Florida pompano and cobia in low-salinity environments; and, 3) Disease Therapeutics Evaluation and Control Research for warmwater fish species, including catfish, trout, tilapia, baitfish, hybrid catfish and hybrid striped bass.

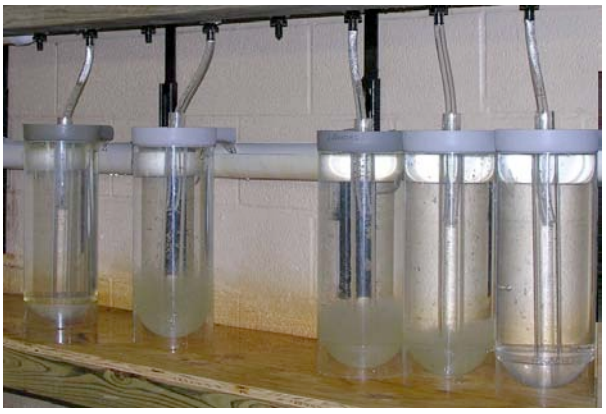
Stuttgart, AR

Ft. Pierce, FL

Dr. Don Freeman, Center Director/Research Leader
P.O. Box 1050, 2955 Hwy.130 East
Stuttgart, AR 72116
870-673-4483

HYBRID STRIPED BASS BROODSTOCK SELECTIVE IMPROVEMENT

Scientists at the Stuttgart National Aquaculture Research Center are evaluating genetic diversity and performance of hybrid striped bass raised in tank-based and pond-based aquaculture systems. Growth performance and disease susceptibility are being evaluated in hybrid striped bass and white bass fingerlings to identify superior producing broodstock for a selective improvement program. Contact Dr. Adam Fuller (adam.fuller@ars.usda.gov) for additional information.

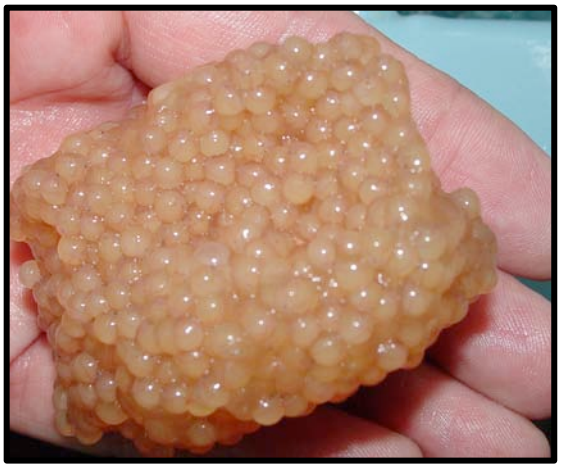


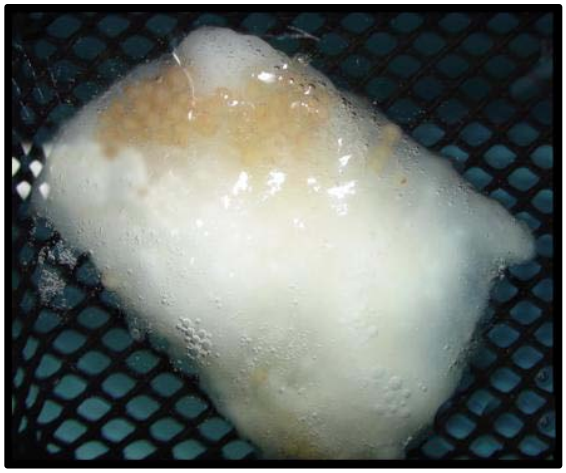
INCREASED PRODUCTION SYSTEM EFFICIENCY

Scientists at the Stuttgart National Aquaculture Research Center focus on developing management strategies that improve production efficiency of warm water fish in pond and mixed suspended growth (biofloc) systems. Preliminary results show that productivity of channel catfish grown in an intensively managed biofloc production system greatly exceeds that for intensively managed earthen ponds. Contact Dr. Bart Green (bart.green@ars.usda.gov) for additional information.

NOVEL INGREDIENTS AND DIETS FOR HYBRID STRIPED BASS

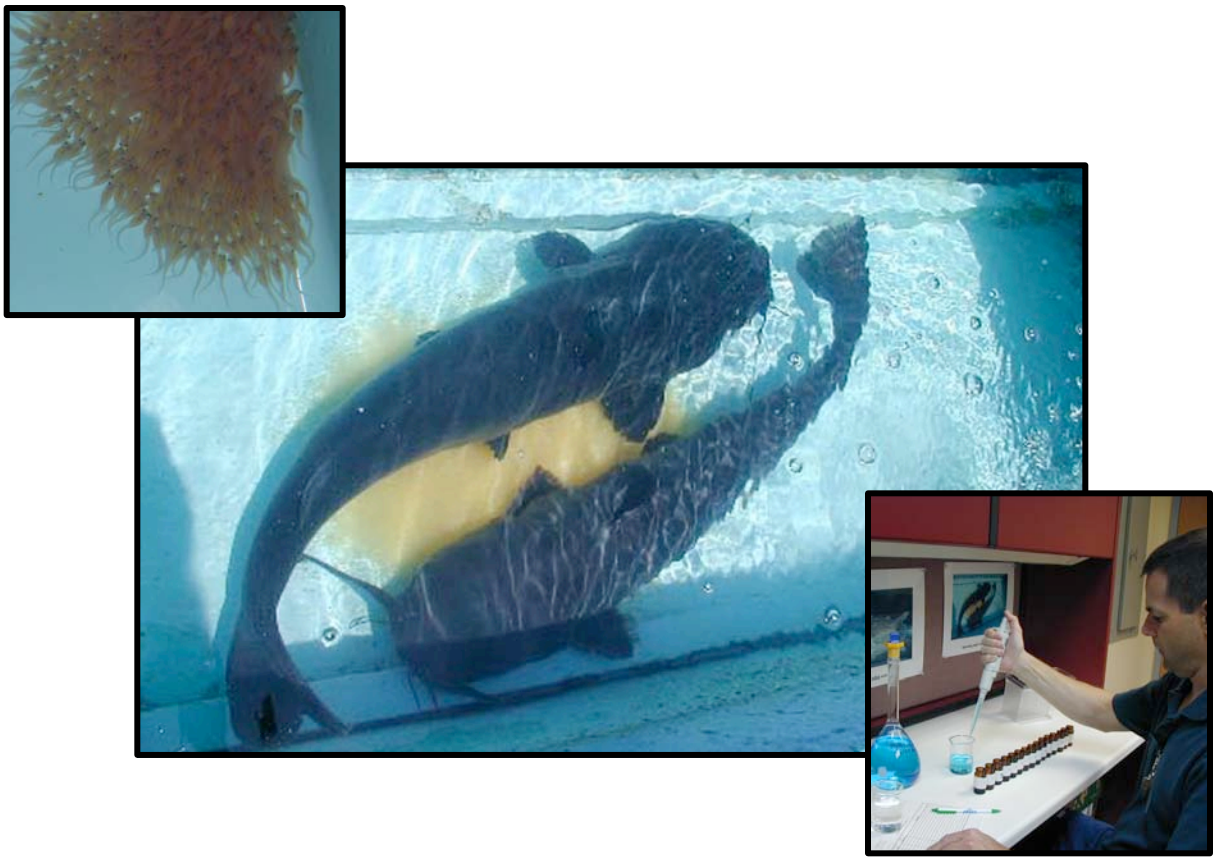
Scientists at the Stuttgart National Aquaculture Research Center are refining nutrient requirements, evaluating alternate sources of protein, and developing practical feed formulas for hybrid striped bass production. Animal and plant by-products that are considered waste or co-products of other food, fiber, or biofuel industries are being tested to replace menhaden-derived fish meal in commercial hybrid striped bass diets. Practical test diets with substantially reduced fish meal content are being tested under commercial conditions to encourage industry adoption. Feeds with modified protein and energy profiles are being developed to optimize production at different culture temperatures. Results of this work are reducing both feed costs and reliance on volatile and limited natural marine resources. Contact Dr. Steve Rawles (steven.rawles@ars.usda.gov) for additional information.

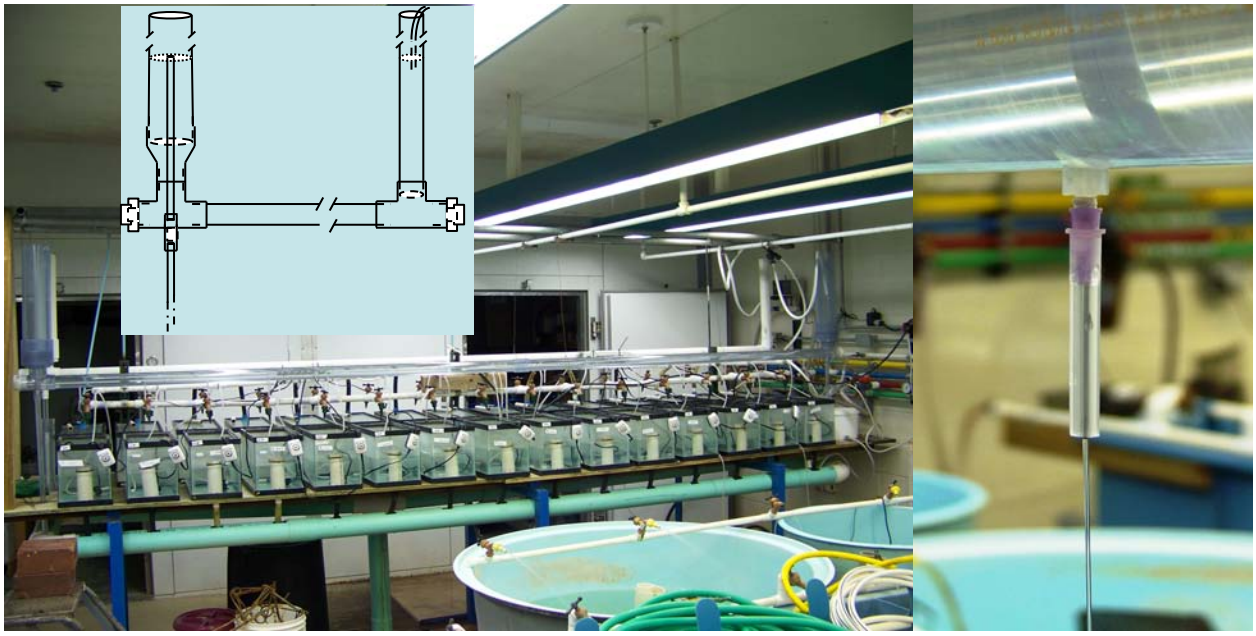




EFFECTIVENESS/SAFETY OF COPPER SULFATE

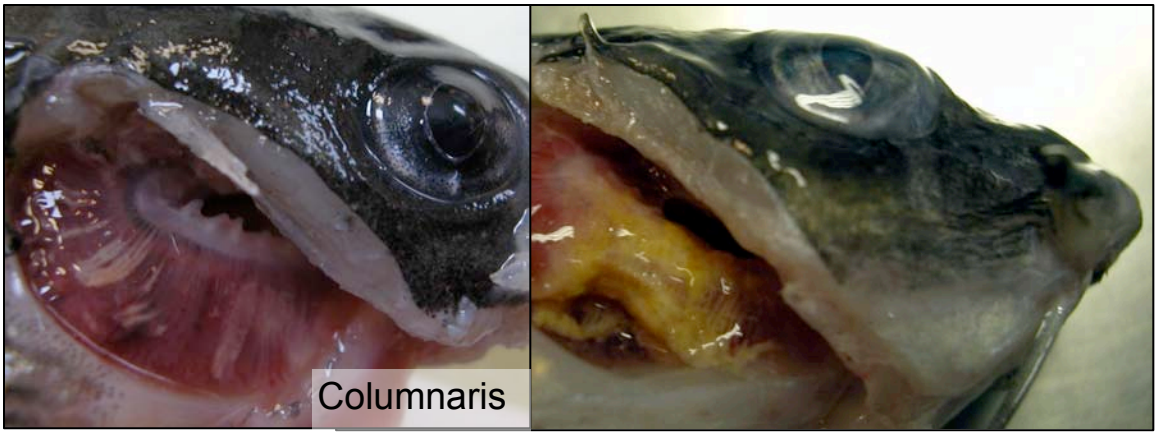
Scientists at Stuttgart National Aquaculture Research Center evaluated the use of copper sulfate to control fungus (water molds) on catfish eggs. These experiments were carried-out in a flow-through hatchery system typical of commercial operations. Area of fungal inhibition and hatch rate of catfish fry was studied to show the product is both safe and effective. This compound is an economical alternative to existing treatment options. Contact Dr. Dave Straus (dave.straus@ars.usda.gov) for further information.





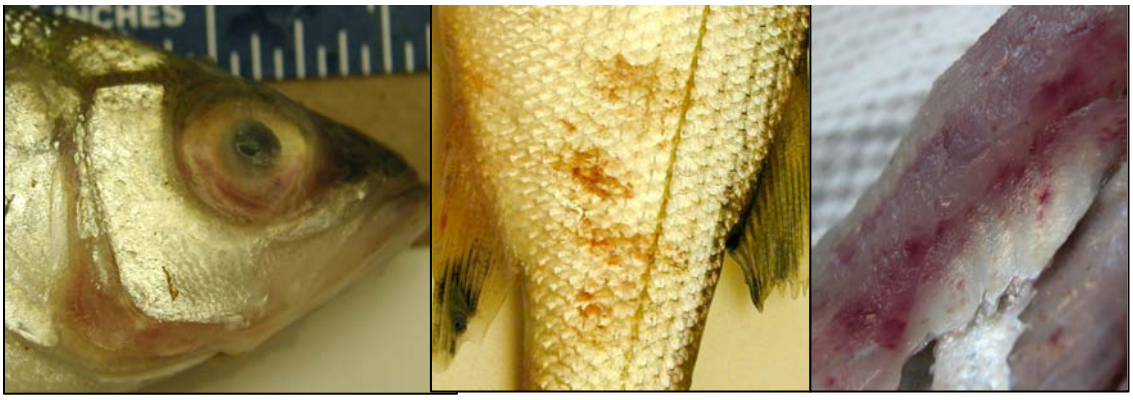
DISEASE CHALLENGES MODELS FOR COLUMNARIS DEVELOPED

Scientists at Stuttgart National Aquaculture Research Center have developed disease challenge models for infecting fish with typical columnaris infections. These models evaluate the natural resistance of channel catfish, hybrid striped bass, and white bass families to columnaris and test the efficacy of therapeutants against the disease. Contact Andrew Mitchell (drew.mitchell@ars.usda.gov) for additional information.



EFFECTIVE METHODS TO CONTROL DEVASTATING FISH DISEASES DEVELOPED

Scientists at Stuttgart National Aquaculture Research Center developed methods to accurately identify and genotype columnaris causative agent and to evaluate the toxicity and efficacy of potential therapeutants against disease. Several antibiotics and chemicals were shown to be safe and effective for the treatment of costly columnaris and streptococcosis infections in channel catfish, sunshine bass and tilapia. Contact Dr. Ahmed Darwish (ahmed.darwish@ars.usda.gov) for additional information.

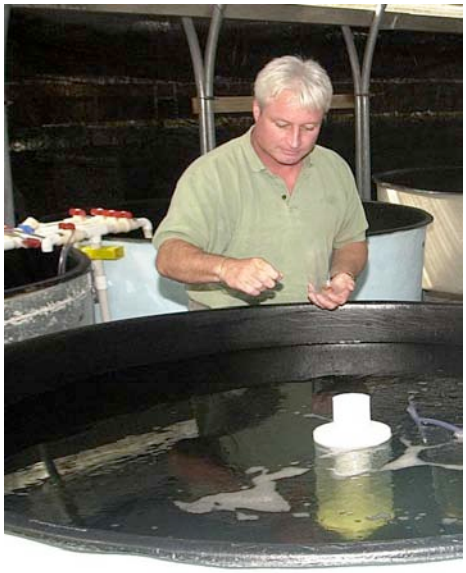


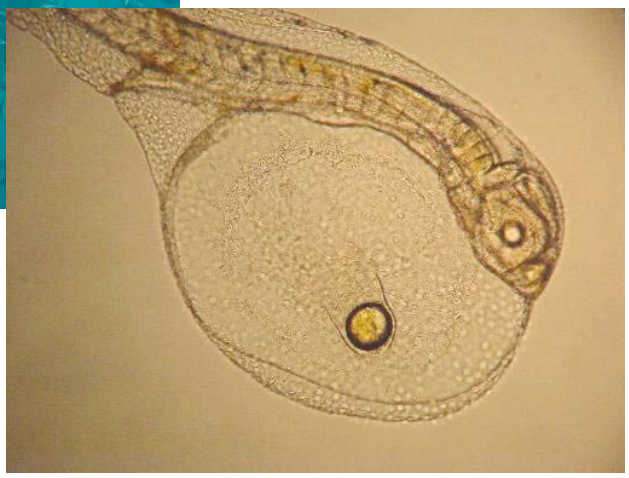
RECIRCULATING AQUACULTURE SYSTEMS FOR LOW-SALINITY FINFISH CULTURE

Scientists at the Stuttgart Aquaculture Center's Ft. Pierce, FL, subunit Sustainable Marine Aquaculture Systems are evaluating control technology for feeding and water quality monitoring of tank finfish production. Their research is focusing on lower labor, energy, and operational costs of current system designs. For additional information contact Dr. Tim Pfeiffer (timothy.pfeiffer@ars.usda.gov).

BETTER FEEDS FOR THE SUSTAINABLE INLAND PRODUCTION OF MARINE FISH

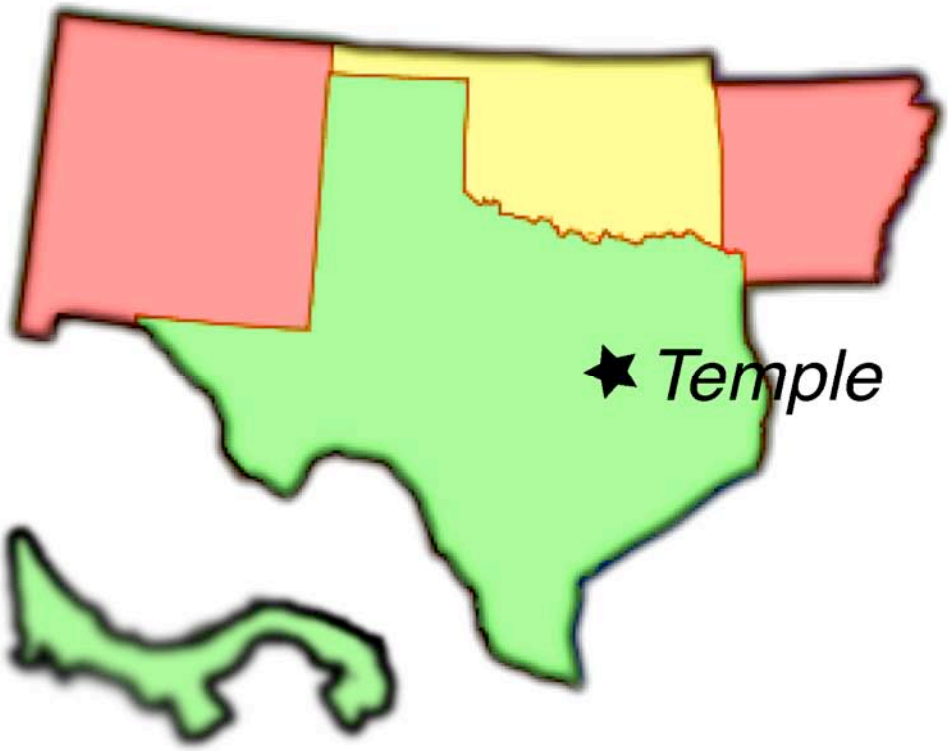
Scientists at the Stuttgart Aquaculture Center's Ft. Pierce, FL, subunit, Sustainable Marine Aquaculture Systems, are identifying new feed ingredients as sustainable alternatives to fish meal and fish oil used in feeds fed to farm raised fish. Utilizing high quality substitutes fish meal use can be reduced by 70-80%. Contact Dr. Marty Riche (marty.riche@ars.usda.gov) for additional information





DEVELOPMENT OF SUSTAINABLE METHODS FOR PRODUCTION OF MARINE FISH SEED STOCK FOR INLAND CULTURE

Scientists at the Stuttgart Aquaculture Center's Ft. Pierce, FL, subunit, Sustainable Marine Aquaculture Systems, in cooperation with Florida Atlantic Univ., are developing year-round spawning strategies for captive broodstock and larviculture methods for sustainable seed production of high-value marine finfish for culture in low-salinity environments. Contact Dr. Don Freeman (don.freeman@ars.usda.gov) for additional information.

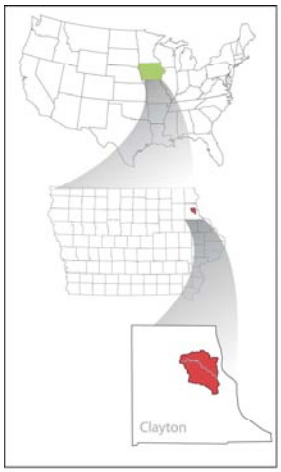

Temple

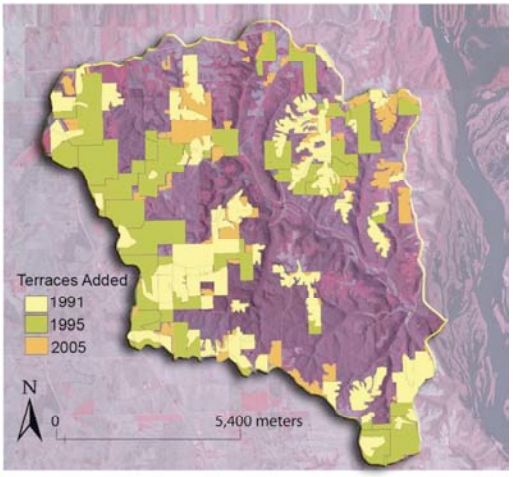
USDA-ARS
GRASSLAND SOIL AND WATER RESEARCH LABORATORY
TEMPLE, TEXAS

MISSION STATEMENT OF THE
GRASSLAND SOIL AND WATER RESEARCH LABORATORY

Our mission is to develop technology for maximizing forage and crop production; reducing uncertainty regarding the effects of global change on agriculture; controlling non-economic brush and weeds; and solving problems relating to efficient use of soil and water, crop production, soil fertility, erosion, hydrology, and water quality. The mission is achieved through simulation modeling and experimental research by a multi-disciplinary staff of scientists and engineers.

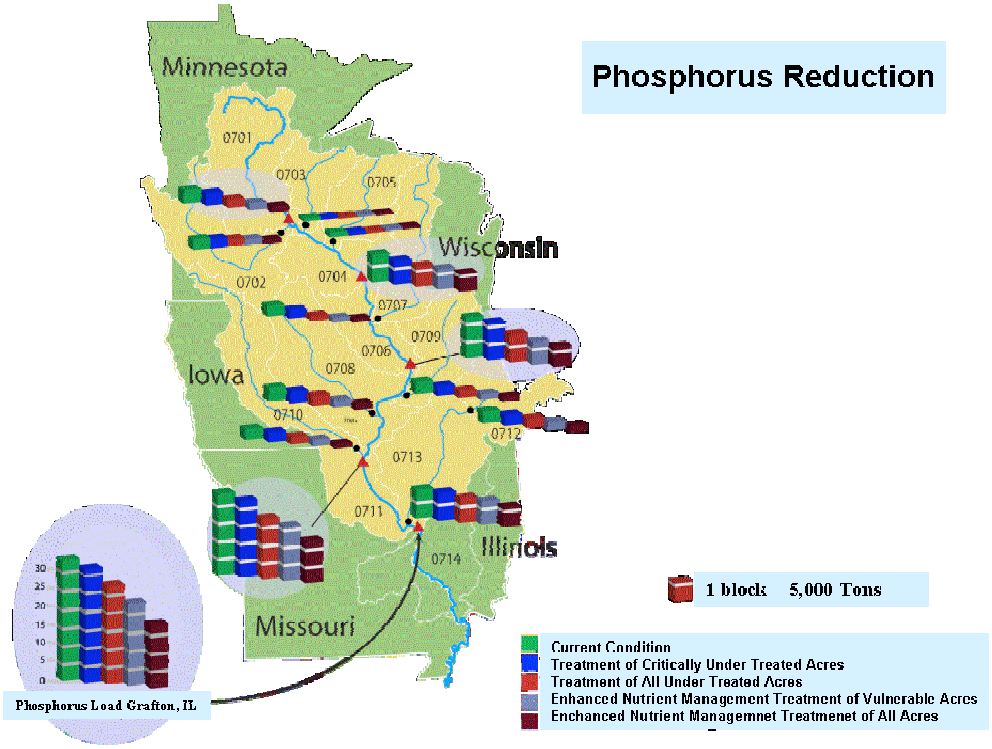
Dr. Jeffrey G. Arnold, Research Leader
808 E. Blackland Road
Temple, TX 76502
254-770-6500





ASSESSMENT OF USDA CONSERVATION PRACTICES

Research at the Grassland, Soil & Water Research Laboratory has resulted in the development of a model called SWAT (Soil & Water AssessTool), capable of predicting the input of land management and climate on water quality in rivers and lakes. The model has been used to evaluate the environmental inputs of USDA conservation programs across the U.S. and influence conservation policy. The model is also being used around the world for water supply and water quality assessments. Contact Dr. Jeff Arnold (jeff.arnold@ars.usda.gov) for additional information.



NEW SOIL TEST METHODS AND CROPPING SYSTEMS REDUCE FERTILIZER

Researchers at the Grassland, Soil, and Water Research Laboratory improved soil test methods to more accurately predict plant available nutrients, thus reducing fertilizer inputs. Fertilizer inputs have been further reduced using the new soil test methods and incorporating legume cover crops with corn-wheat-soybean crop rotations. We also grow, harvest and process our own biodiesel from soybean and sunflowers. Contact Dr. Rick Haney (rick.haney@ars.usda.gov) for additional information.

OPTIMIZING BIOFUEL GRASS YIELDS

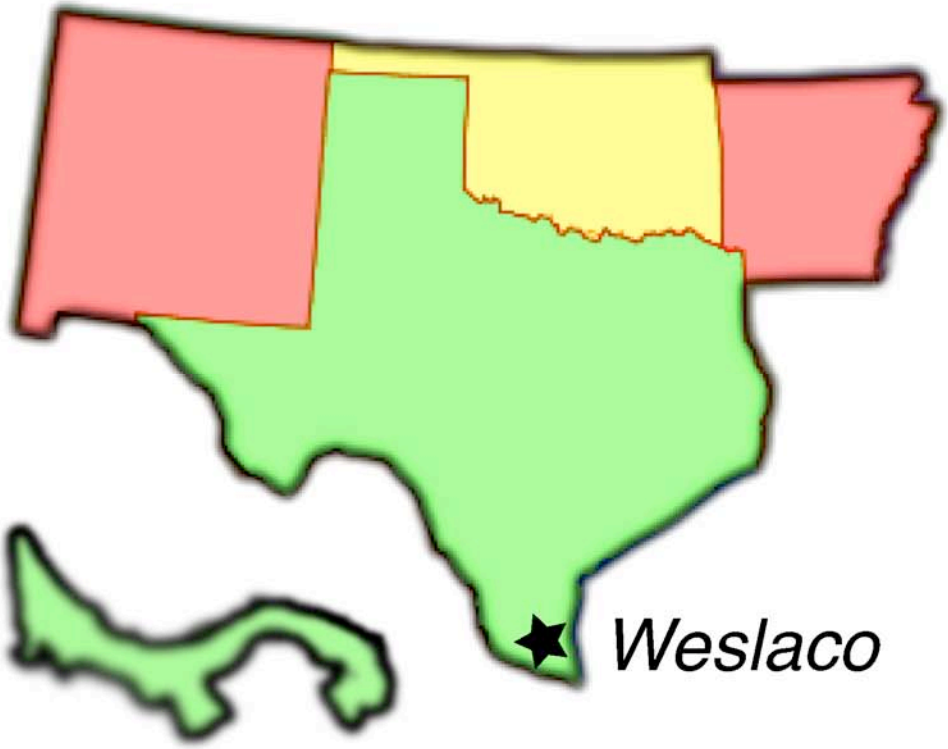
Researchers at the Grassland, Soil, and Water Research Laboratory quantify light, nutrient, and water use efficiencies of promising biofuel plant species. Values from these studies are used in simulation models to predict yields and environmental impacts of various biofuel grass management systems. Contact Dr. Jim Kiniry (jim.kiniry@ars.usda.gov) for additional information.

POULTRY APPLICATION RECOMMENDATIONS DEVELOPED

Research at the Grassland, Soil & Water Research Laboratory has resulted in recommendations for poultry litter applications that are economically profitable and environmentally sound. Poultry litter was applied at varying rates and nitrogen and phosphorus transport were monitored. The results are assisting farmers and ranchers in managing their land efficiently. Contact Dr. Daren Harmel (daren.harmel@ars.usda.gov) for additional information.

A MODEL MEANS OF ASSESSING RANGELAND CONSERVATION EFFORTS

Researchers at the Grassland, Soil, and Water Research Laboratory collaborate with NRCS researchers in the Great Basin to quantify effects of land management techniques recommended by the Conservation Effects Assessment Project (CEAP) on water dynamics and quality, soil quality, and vegetation response. We use the plant model, ALMANAC, and watershed model, SWAT, to simulate long-term effects of various management strategies. This will help determine the effectiveness of and support the refinement of rangeland conservation programs. Contact Dr. Mari-Vaughn Johnson (mari-vaughn.johnson@ars.usda.gov) for additional information.


Weslaco

MISSION STATEMENT OF THE KIKA DE LA GARZA SUBTROPICAL AGRICULTURAL RESEARCH CENTER

The mission of the Kika de la Garza Subtropical Agricultural Research Center (KSARC) is to increase food and fiber productivity by developing new technology for safe and efficient agricultural production methods and by conserving natural resources and protecting the environment. The Center's four interactive research units accomplish this object through work on (1) Pollination and pests of honey bees; (2) Biological control methods to identify and defeat present and potential pest threats to Rio Grande Valley agriculture; (3) Organic farming systems utilizing holistic approaches to healthy and nutritious food production; (4) Quarantine treatments of subtropical fruits and vegetables; (5) Post harvest treatments of produce for disinfestations by non-chemical means; (6) Aerial remote sensing of agricultural problems; and (7) Pesticide tolerance of vegetable, ornamental, and specialty crops for registration labeling and EPA compliance.

PEST MANAGEMENT STRATEGIES DEVELOPED

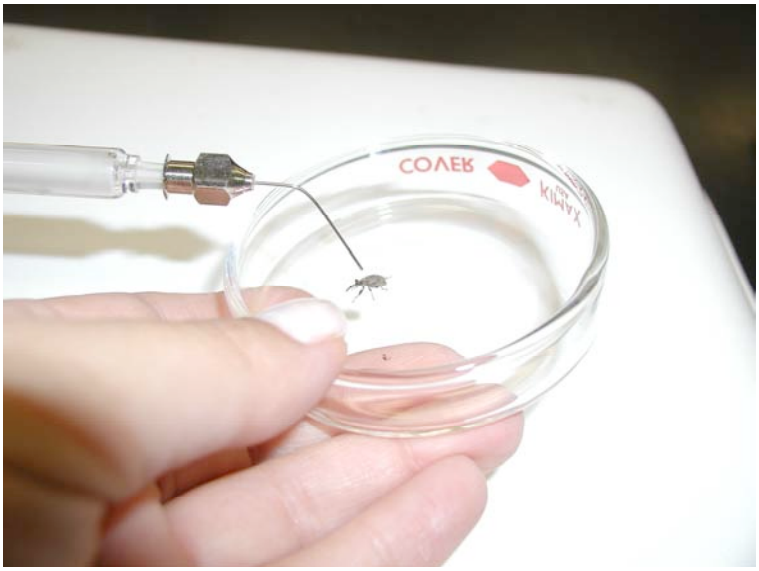
ARS scientists are developing integrated pest management strategies to control key pests of cotton. New technologies, including transgenic cottons are being developed in cooperation with industry partners that offer season-long protection against key pests. Scientists are also determining when pests of other crops in the subtropics move into cotton so that management decision can be developed on a landscape level. For more Information, contact John Adamczyk (john.adamczyk@ars.usda.gov).

UNDERSTANDING ASIAN CITRUS PSYLLID (ACP) BEHAVIOR

The Asian citrus psyllid (ACP) is the vector of huanglongbing or citrus greening disease, one of world's most devastating citrus diseases. Scientists at the Beneficial Insects Research Unit are discovering how the Asian citrus psyllid uses the appearance and aroma of citrus trees to find trees upon which to feed, mate, and lay eggs. This information is being used to develop scent lures and improve the design of traps that will enhance detection and monitoring of ACP. Contact Dr. Joe Patt (joseph.patt@ars.usda.gov) for additional information.

BIOLOGICAL CONTROL OF GIANT REED

Researchers in the Beneficial Insects Research Unit have developed tools for biological control of giant reed (Arundo donax), an exotic invasive weed of the Rio Grande Basin. Giant reed consumes critical water resources in the arid southwestern U.S. and Mexico, increases stream bank erosion, fuels wildfires, and hinders river access. Until now, infestations have been managed with costly chemical and mechanical methods. Several insects from the native range in Mediterranean Europe have been imported and evaluated for biological control of giant reed. A stem galling Arundo wasp was released in Texas in April 2009. A stem- and root-feeding Arundo scale insect has been recommended for approval for field release and is scheduled for release in the fall of 2009. For more information, contact Dr. John Goolsby (john.goolsby@ars.usda.gov).

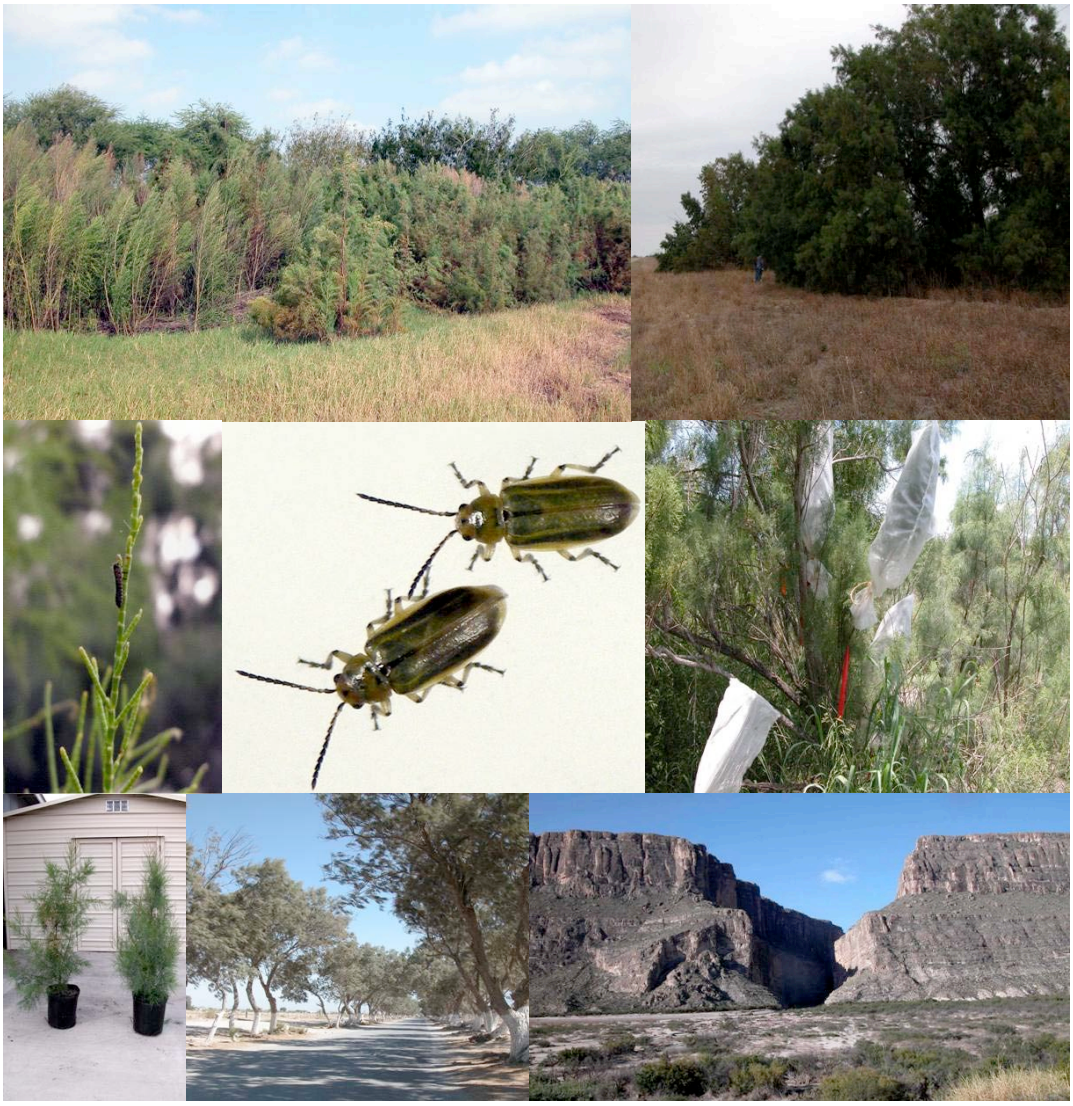


MANAGEMENT OF THE BOLL WEEVIL

Scientists at the USDA-ARS, Beneficial Insect Research Unit are responsible for conducting research that contributes to integrated options for controlling field crop pests. The Unit has made significant contributions to the biology and management of the boll weevil that entered the United States in the late 1800's near Brownsville. Specific scientific information provided by the scientists in support of eradicating the boll weevil from the United States has included discovering the life history and biology of the boll weevil in the subtropical environment. Management techniques such as chemical and mechanical stalk destruction, the evaluation of different pheromone formulations used in trapping weevils, and investigating the status of the boll weevil's susceptibility to malathion when collected from Texas and Mexico have been researched and published in various journals through out the world. Malathion is an insecticide used exclusively in areawide pest management and eradication programs. Alternative insecticides have also been evaluated using a leaf-disk assay developed by Texas A&M and USDA scientists. For more information, please contact Scott Armstrong (scott.armstrong@ars.usda.gov).

PARASITIC WASP IS A NOVEL NATURAL ENEMY TO HELP COMBAT THE GLASSY-WINGED SHARPSHOOTER

In collaboration with scientists at the ARS South American Biological Control Laboratory-Argentina, The University of California-Riverside, and the California Department of Food and Agriculture, foreign exploration in South America and molecular studies lead to the discovery of a novel natural enemy to help combat the glassy-winged sharpshooter, a serious economic pest of grapevines. The new natural enemy Gonatocerus deleoni, a tiny parasitic wasp, is being permitted for release in California. Contact Dr. Jesse de León (jesus.deleon@ars.usda.gov) for addition information.



BIOLOGICAL CONTROL OF SALTCEDAR USING LEAF-FEEDING BEETLES

Researchers at the Beneficial Insects Research Unit have determined that biological control of exotic, invasive, water-consuming saltcedar bushes poses little or no risk to a large tree known as athel, a close exotic relative of saltcedar that is used for shade and as a windbreak in the southwestern U.S. and Mexico. Biological control of saltcedar using leaf-feeding beetles imported from their native range in North Africa is now being evaluated at field sites in environmentally critical habitats along the Rio Grande containing both saltcedar and athel. For more information, contact Patrick Moran, (patrick.moran@ars.usda.gov).

BOLL WEEVIL MANAGEMENT STRATEGIES

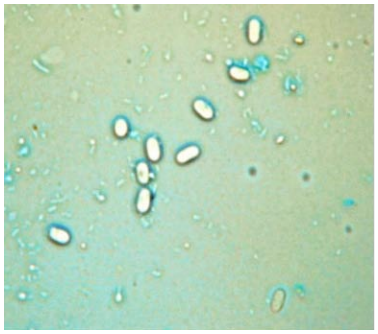
Research at the Beneficial Insect Research Unit in cooperation with Texas AgriLife Research evaluated biology and population dynamics of insect pests of row crop agriculture, with emphasis on the boll weevil (BW) in cotton; developed some practices for controlling overwintering BW; determined effects on BW survival of different cultural practices; assessed impacts of alternative BW management strategies on other pest and non- pest arthropod species in the agroecosystem; and determined effects of transgenic cotton in minimizing risk of outbreaks of lepidopteran under BW eradication and augmented activity of beneficial insects. Contact Dr. S. M. Greenberg (shoil.greenberg@ars.usda.gov) for additional information.

DISCOVERY OF NOCTURNAL PREDATORS OF CATERPILLAR PEST EGGS IN COTTON AND SOYBEANS

Cursorial spiders and the recently discovered Asian cockroach are notable discoveries of nocturnal predators of caterpillar pest eggs in cotton and soybeans in subtropical south Texas.

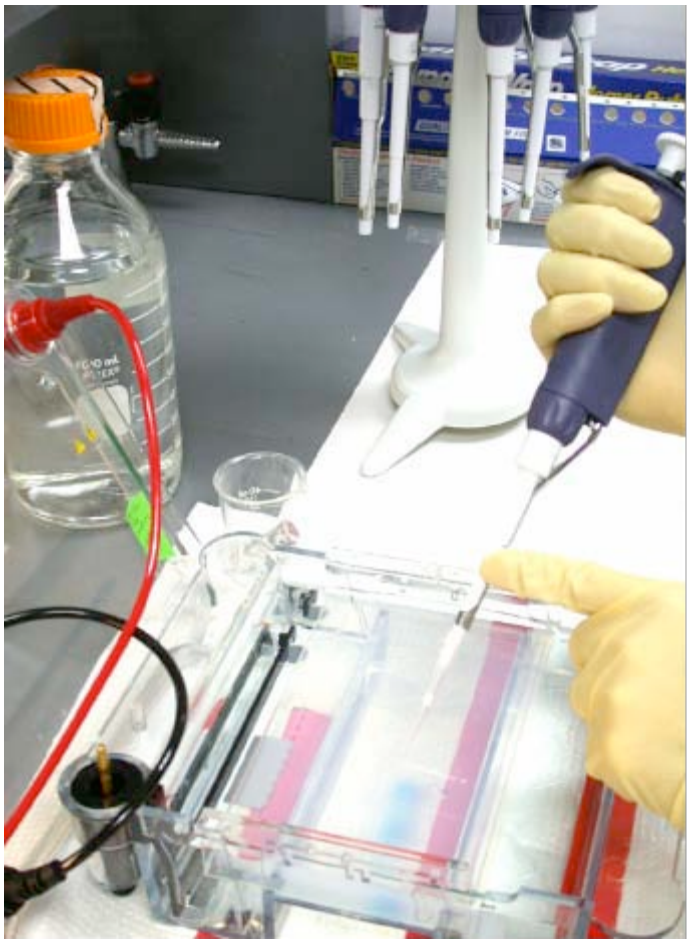
Researchers have determined that cursorial spiders that are important predators in annual crops of south Texas, fed on and benefited greatly from floral and extra-floral nectars, pollen and other non-prey resources. Further work is being conducted on the ability of these spiders to develop on yeast-based artificial diets. With this information we are developing nutrient supplements to augment spider populations in crops.

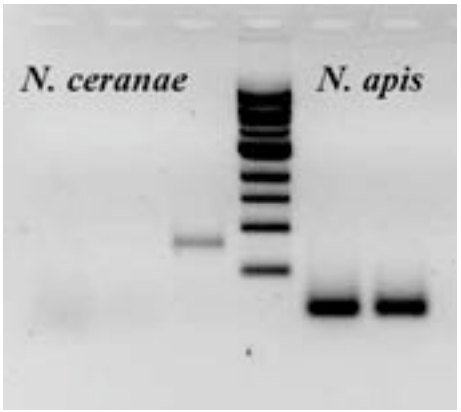
During nocturnal observations of predation on caterpillar eggs in soybean, the exotic Asian cockroach that had recently colonized south Texas was determined to feed on large numbers of these eggs. The ecology of this exotic cockroach is being examined to determine its role in agricultural systems. Contact Dr. Bob Pfannenstiel (bob.pfannenstiel@usda.ars.gov) for more information.

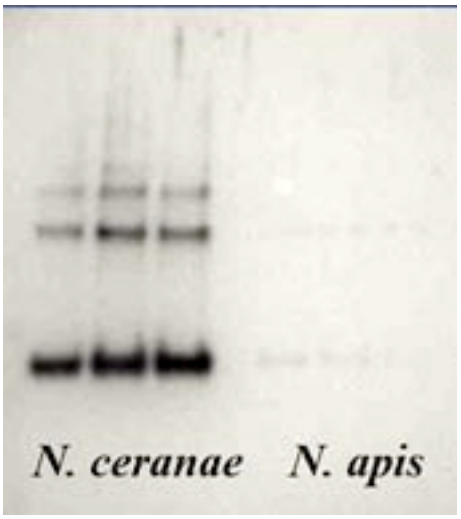


ANTIBODIES AGAINST HONEY BEE PARASITE DEVELOPED

We have recently developed polyclonal antibodies (Abs) against *N. cerana,* one of the most prevalent and economically damaging parasites of honey bees. A new diagnostic dipstick test will be developed using our new *N. ceranae*-specific Abs. Test will be used by both hobbies and commercial beekeepers to monitor progression of the disease and to minimize the use of synthetic chemicals in bee colonies. Contact Dr. Kate Aronstein (kate.aronstein@ars.usda.gov) for additional information.

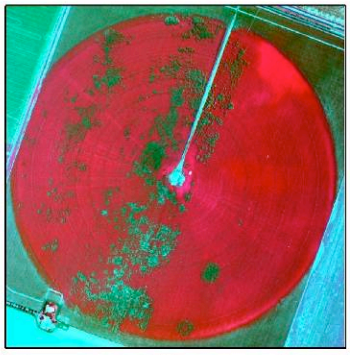


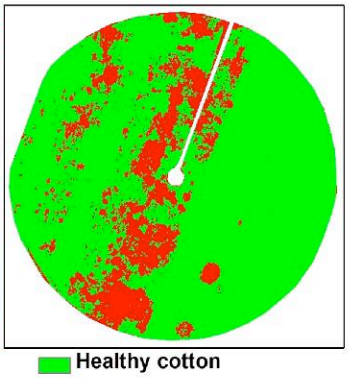


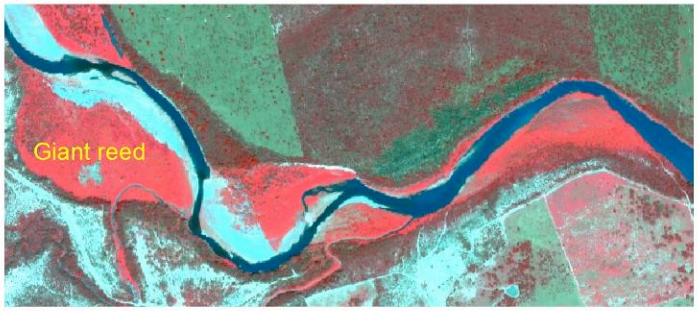


BOLL WEEVIL ECOLOGY IN SUBTROPICS REVEALED

Researchers detailed the ecology of cotton boll weevils in the subtropics, revealing the insect in a new light by correcting long-held assumptions about foods, overwintering, and dormancy. Boll weevils, for example, were found to feed and survive for extended periods on endocarps of some citrus species and large numbers occurred around citrus orchards during winter. Research is underway to determine interactions between crop plants (e.g., sugarcane), soil and foliar amendments, water availability, and pests. Contact Dr. Allan Showler (allan.showler@ars.usda.gov) for additional information.

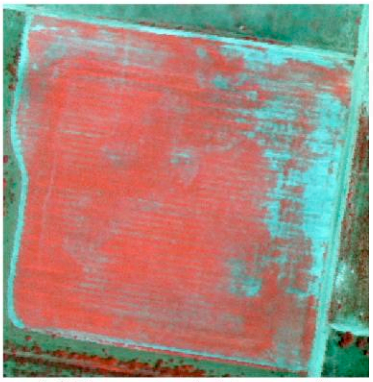




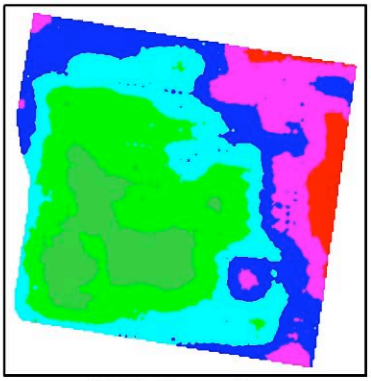


REMOTE SENSING FOR CROP AND PEST MANAGEMENT

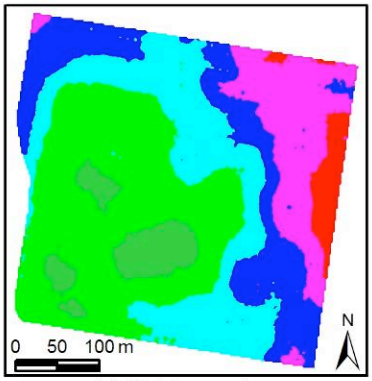
Scientists at Kika de la Garza Subtropical Agricultural Research Center develop and test advanced airborne multispectral and hyperspectral imaging systems for agricultural applications. These imaging systems along with high resolution satellite imagery are evaluated and used for detecting pests and estimating yields in cropland and for mapping invasive weeds (giant reed and saltcedar) in rangeland and wetland ecosystems. Contact Dr. Chenghai Yang (chenghai.yang@ars.usda.gov) for additional information.

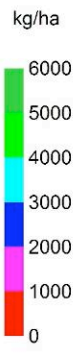


(a) Hyperspectral image of a grain sorghum field



(b) Yield map from yield monitor data

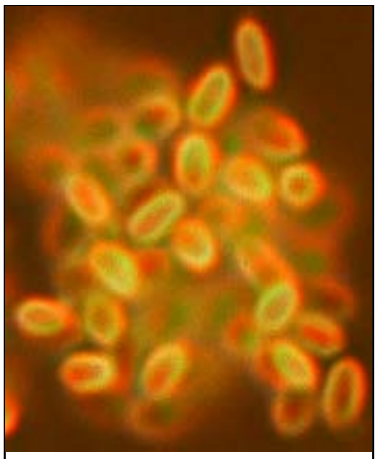




(c) Yield map from hyperspectral image

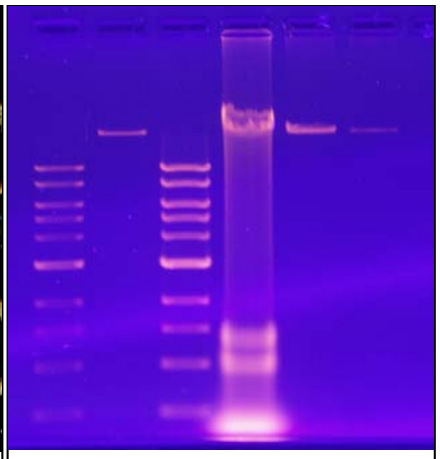
LIGHT MANAGEMENT IN BLACKBERRY PRODUCTION SYSTEMS

Research at the Integrated Farming & Natural Resources Research Unit showed that opaque synthetic weed barriers improved yield over bare ground controls (top view). Using white plastic for weed control resulted in high fruit yield, berry quality, least amount of weed removal time, and most moderate soil temperature. Both reflective mulch and shading improved fruit yield up to 140% compared to bare soil and no shade (left view). Contact Dr. Donald Makus (donald.makus@ars.usda.gov) for additional information.



AFB Spores

Rope Test for AFB



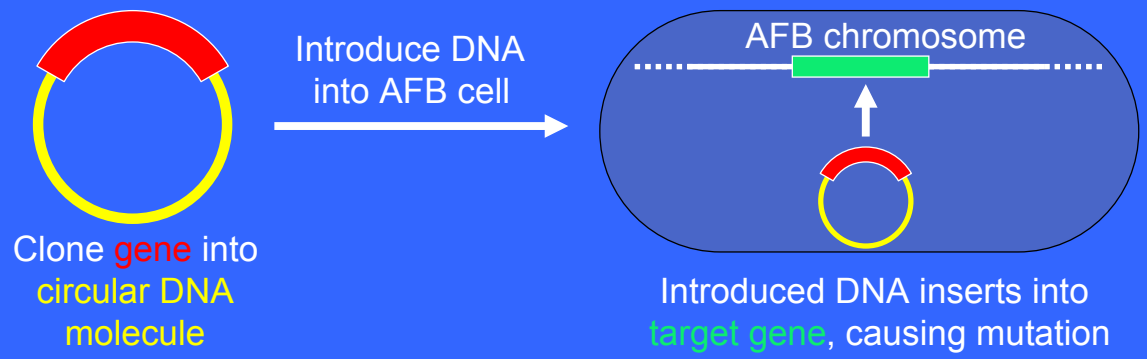
DNA on a "gel"

IDENTIFICATION OF AFB GENES IMPORTANT FOR INFECTION OF HONEY BEES

American Foulbrood (AFB) is a disease of honey bees caused by bacteria. This highly contagious disease can kill an entire bee colony. Our ultimate goal in this project is to produce anti-AFB treatments directed against important AFB genes. We have identified potentially important genes and are now making AFB mutants (see below) that we will test on honey bee larvae. For more information, contact Dr. Dan Murray (keith.murray@ars.usda.gov)

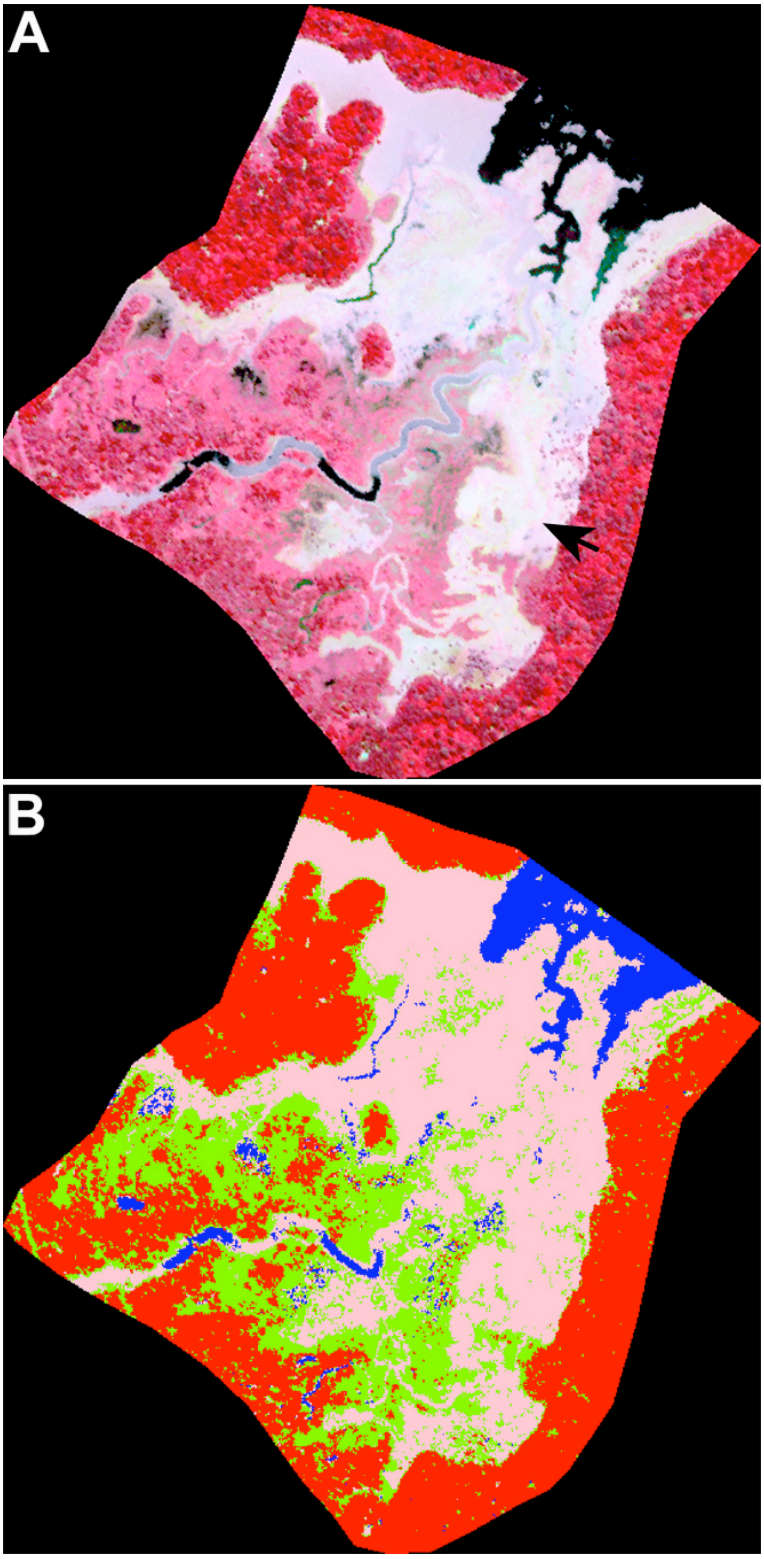
Making AFB Mutants

For candidate AFB genes:



If the gene is important for infection, the AFB mutant will not infect bee larvae

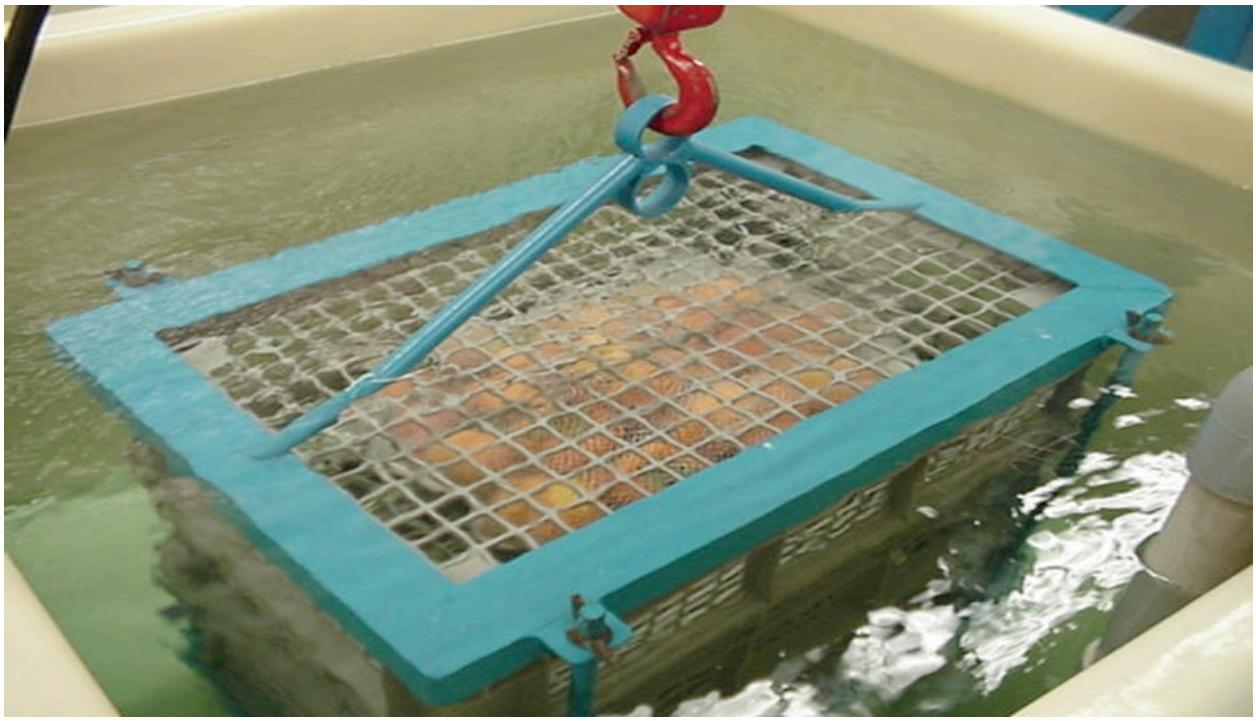
REMOTE SENSING OF AN INVASIVE WEED



Researchers at the Kika de la Garza Subtropical Agricultural Research Center, in collaboration with Texas Parks and Wildlife Department personnel have used QuickBird satellite imagery to map the invasive aquatic weed, giant salvinia, in Toledo Bend reservoir in east Texas. The color-infrared satellite image of the study site is shown in print a. The arrow points to giant salvinia. The computer classification map of the image is shown in print b. Color codes for the surface types on the classified map are: pink, giant salvinia; red, mixed woody vegetation; green, mixed aquatic vegetation; and blue, water. Contact James Everitt (james.everitt@ars.usda.gov) for additional information.

THE IMPACT THAT PARASITES AND DISEASES HAVE ON THE ABILITY OF HONEY BEES TO POLLINATE ALMONDS

Almond pollination during late winter has become a major portion of beekeeper income. The Weslaco Honey Bee Research Unit is examining the impact that parasites and diseases have on the ability of honey bees to pollinate this important crop. Contact Dr. Frank Eischen (frank.eischen@ars.usda.gov) for additional information.

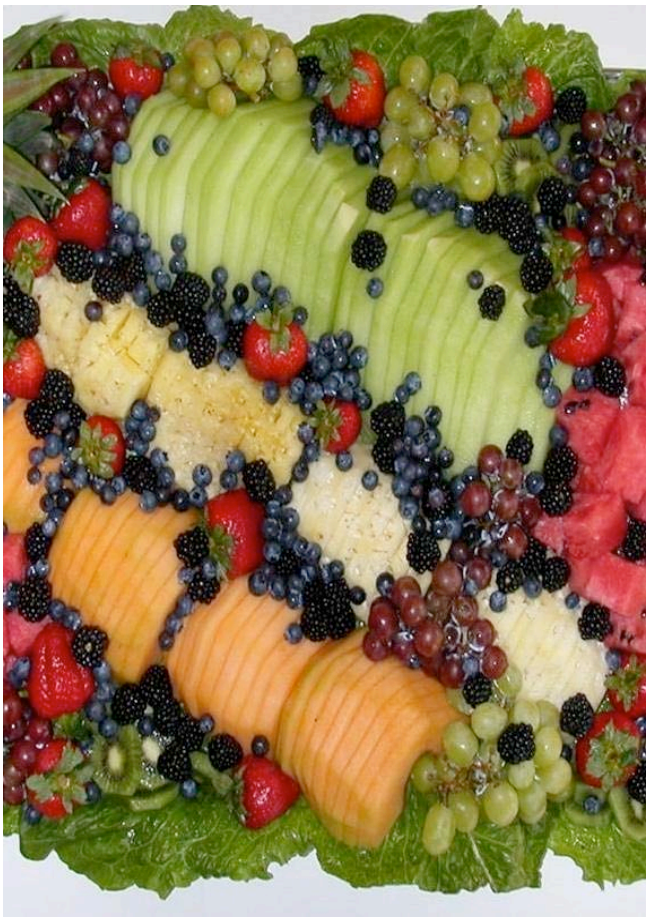


OVERCOMING QUARANTINE BARRIERS TO AGRICULTURAL TRADE

Researchers at the Crop Quality & Fruit Insects Research Unit develop measures to prevent movement of invasive species infesting products of agricultural trade. A variety of techniques including heat, cold, fumigation, ionizing radiation, and some more exotic ones are being developed for produce that may be infested by quarantine pests such as fruit flies. Contact Dr. Guy Hallman (guy.hallman@ars.usda.gov) for additional information.

NUTRITIONAL and MARKET QUALITY ENHANCEMENT TECHNOLOGY

Research at the Crop Quality and Fruit Insects Research Unit has lead to development of a grower-based technology that enhances marketable fruit quality and human-nutrient levels. Leaf applications of calcium and potassium, during melon fruit growth, enhances fruit firmness, sweetness, human-health bioactive compound concentrations and postharvest shelf-life. Demonstrated with melons, in greenhouse and field trials in Weslaco, Texas repeated results show a 30% increase in sugars, beta-carotene (color), firmness and fresh-cut shelf-life. The increased sugars allows growers to market fruit at the highest income grade 'USDA Fancy'. Contact Dr. Gene Lester (gene.lester@ars.usda.gov) for additional information.



ROLLING BLACK OAT (AVENA STRIGOSA) COVER CROP IN PREPARATION FOR PLANTING VEGETABLES.

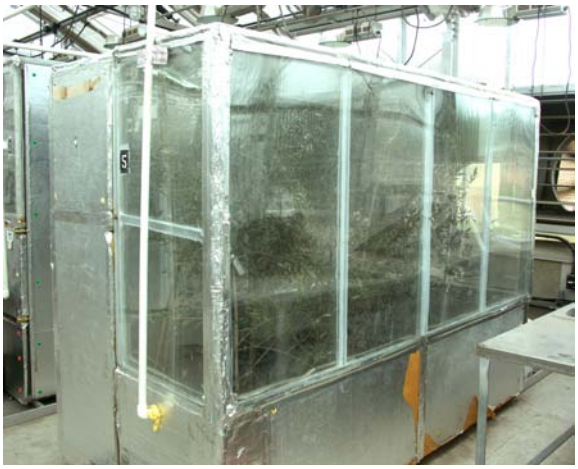
Black oats is one of a number of promising cover crops that produce large amounts of biomass in the cool winters of south Texas. Their contribution to soil organic matter, weed control and moisture retention suggest they are a good choice for rotation with warm season crops. Summer cover crops are also being investigated for rotation with cool season crop in the Rio Grande Valley. Contact Dr. Larry Zibilske (larry.zibilske@ars.usda.gov) for additional information.

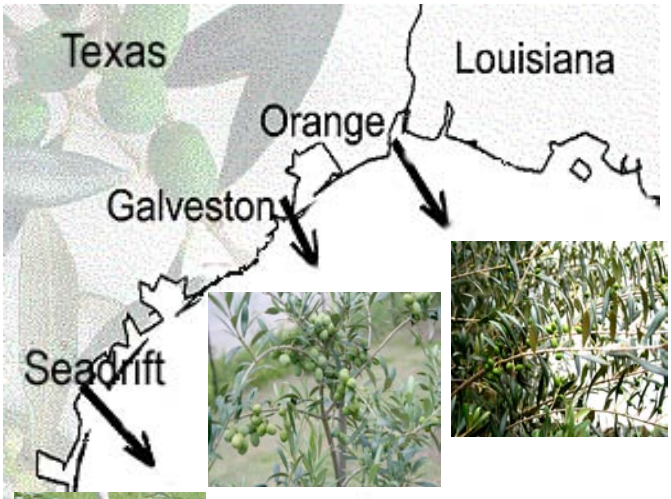
PREPARING ONION ROOTS FOR EXAMINATION OF RHIZOSPHERE EFFECTS OF DIFFERENT FERTILIZER SOURCES.

Crops grown in soils low in organic matter content suffer low yields and quality. Management practices that promote organic matter enrichment tend to promote beneficial microbial populations in the rhizosphere of crops. Research has also shown marked benefits in soil nutrient transformations and subsequent crop uptake where soil organic matter building practices are employed. Contact Dr. Larry Zibilske (larry.zibilske@ars.usda.gov) for additional information.

INSTALLING SOIL MOISTURE SENSORS TO EVALUATE WATER SAVINGS BY MULCHING COVER CROP RESIDUES

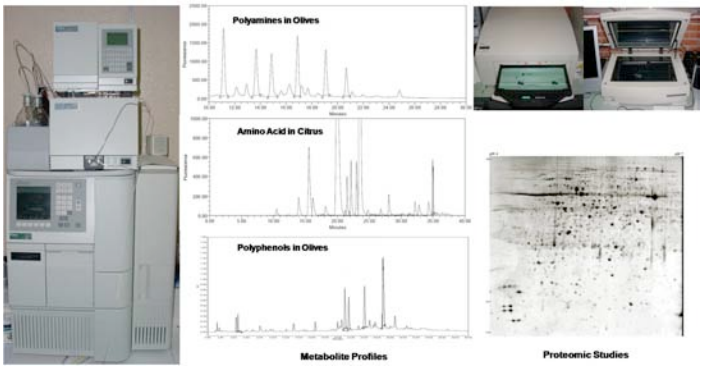
Cover crop residues need proper management to ensure water and crop nutrient conservation in hot climates. Research has demonstrated that leaving residues standing is better than mowing by either sickle bar or rotary flailing. Soil microbial biomass is also conserved, probably due to better water retention and cooler soil temperatures beneath the mulch. These factors create and sustain a favorable environment for subsequent crop production Contact Dr. Larry Zibilske (larry.zibilske@ars.usda.gov) for additional information.





PHYSIOLOGICAL AND BIOCHEMICAL APPROACHES TO PEST AND STRESS MANAGEMENT

Historically, olives have not been grown in Texas. Earlier researchers suggested that it is impossible to grow olives in Texas. Scientists at Kika de la Garza Subtropical Agricultural Research Center invented inexpensive growth chambers which they utilized to develop new hypothesis about climate requirements leading to findings that million of acres along coastal Texas can be used to grow olives. In addition, these growth chambers were used to develop methods for producing vegetative branching or flowering in citrus to study Asian Citrus Psyllid infestation. Biochemical studies are being conducted to develop predictive models for pest and stress management in citrus. Contact Dr. Nasir Malik (Nasir.Malik@ars.usda.gov) for additional information.



MANAGEMENT OF INVASIVE PESTS AND DETERMINING HOSTS OF TROPICAL INVASIVE FRUIT FLIES

Scientists at the Crop Quality & Fruit Insects Research Unit addressed two components
of the project to protect subtropical regions of the U.S. from invasive fruit flies. Alternatives to insecticide sprays by using attractive baits with organic insecticides that are housed in discrete stations, were developed. We tested these baits in stations for pest populations at field sites in San Luis Potosi, Mexico, and tested their effects on bees in Texas. A second project involved testing the host status of citrus for less common invasive fruit flies. We determine survival of these pests in citrus by allowing flies to lay eggs in specific parts of the fruit then measuring survival of eggs and larvae in the various fruit tissues. Contact Robert Mangan (robert.mangan@ars.usda.gov) for additional information.

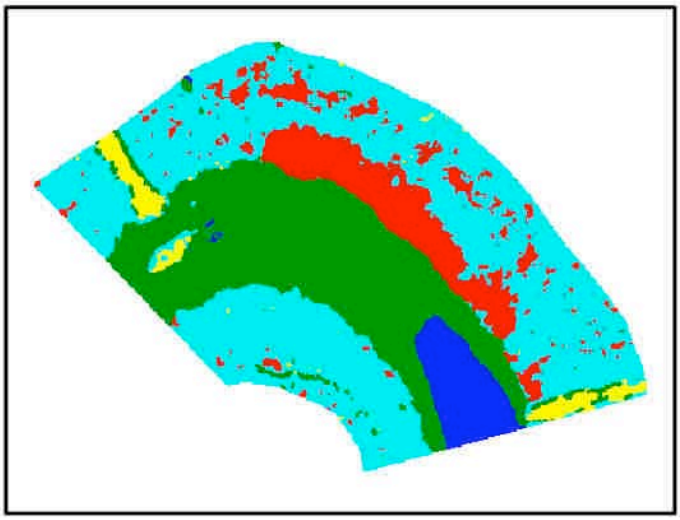
FUNGI SOUGHT TO CONTROL VARROA MITES AND SMALL HIVE BEETLES

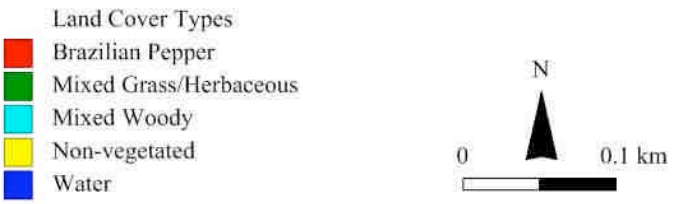
We are currently measuring developmental and reproductive rates of Small Hive Beetle (*Aethina tumida*) in order to develop a simulation model of its population dynamics. We hope to use the simulation model to determine the susceptible life stages of the beetles and to evaluate the impact of different control strategies.

We are also working with Dr. Frank Eischen's team in exploring for naturally-occurring entomopathogenic fungi on varroa mites collected in southern Texas. We are currently looking for disease-causing fungi which we hope to evaluate in lab and field experiments for potential in controlling varroa mites and possibly Small Hive Beetles. Contact Dr. William Meikle (william.meikle@ars.usda.gov) for additional information.

INVASIVE WEED INFESTATIONS: BRAZILIAN PEPPER

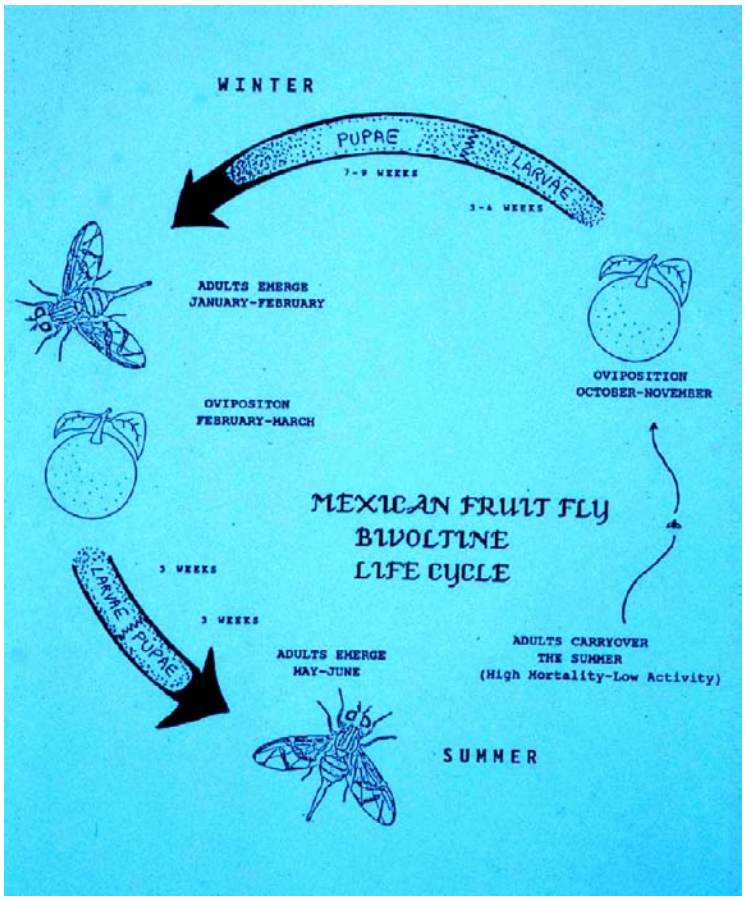
Scientists at KSARC are evaluating spatial information technologies as tools for mapping and monitoring invasive weed infestations in riparian and wetland ecosystems. Preliminary findings have indicated that aerial photography and image processing software can be used to develop maps of Brazilian pepper infestations in South Texas. The maps are easy to interpret and use as decision support tools. Contact Dr. Reginald S. Fletcher (reginald.fletcher@ars.usda.gov) for more information.

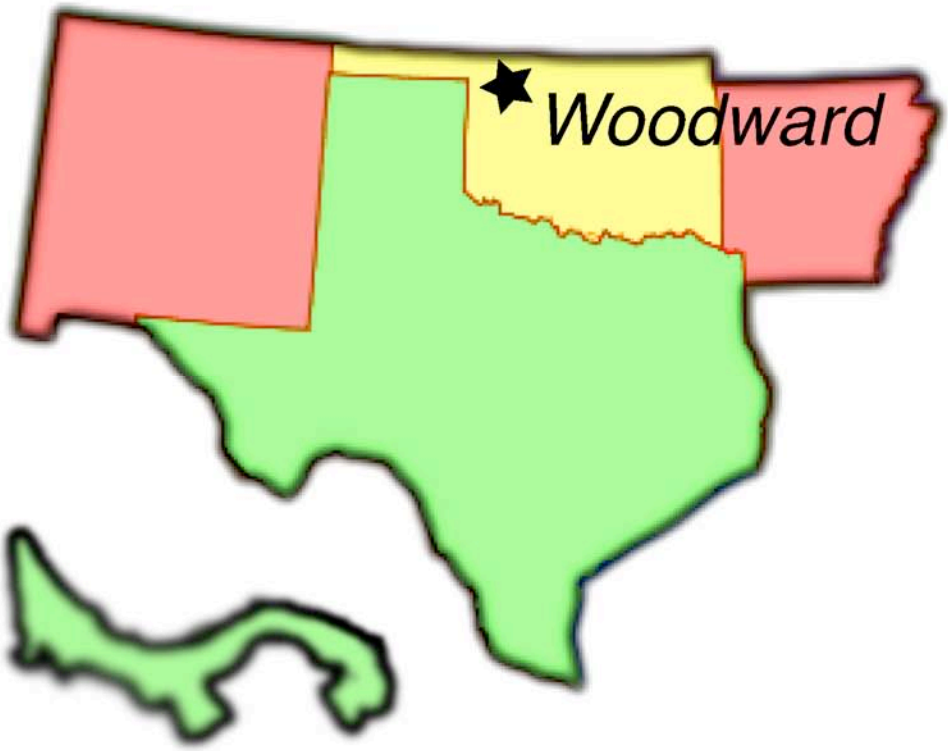




MEXICAN FRUIT FLY POPULATION DYNAMICS

Research at the Crop Quality and Fruit Insects Unit revealed that seasonal host usage patterns could be used to better time pest management solutions. Contact Dr. Donald Thomas (donald.thomas@ars.usda.gov) for more information.




Woodward

THE MANAGEMENT OF CATTLE MIXED-GRASS PRAIRIE

Livestock research at the Southern Plains Range Research Station evaluates management practices that affect the nutrition of grazing cattle and the impact of cattle on rangeland ecology. On its 4,300 acres of native mixed-grass prairie and improved pastureland, investigations are underway on the mineral nutrition of stocker cattle and the effect of nutritional management of beef cows during gestation on calf productivity. Projects at this station can research cattle from conception to harvest. Contact Dr. Stacey Gunter (stacey.gunter@ars.usda.gov) for additional information.

HARVESTING, CLEANING, AND NO-TILL DRILLING TEXAS BLUEGRASS

Scientists at the Southern Plains Range Research Station are developing methods to harvest and clean the extremely cottony seed-head of Texas bluegrass to enable drill based establishment. Texas bluegrass is a native perennial cool-season grass that produces quality forage when many other grasses are unavailable or lower in quality. Contact Dr. Jason Goldman (jason.goldman@ars.usda.gov) for additional information.

QUALITY WARM-SEASON GRASS FOR THE SOUTHEASTERN US

Researchers at the Southern Plains Range Research Station, in cooperation with the Natural Resources Conservation Service Plant Material Center, released 'Verl' eastern gamagrass. Verl is recommended for pasture or hay in the eastern and southern US where appropriate management prevents damage to plant stands. Contact Dr. Tim Springer (tim.springer@ars.usda.gov) for additional information.