Get connected to explore real-world science...

A Battle of Food for the Future

Gardens of the Galaxy

This Arkansas Soybean Science Challenge, funded by the Arkansas Soybean Promotion Board and Arkansas Farmers through Soy Checkoff funds.
Gardens of the Galaxy: A Battle of Food for the Future
Teacher Discussion Guide

Science is a great pursuit.

It is, however, not one without controversy.

The debate over genetically modified organisms (GMOs) continues to be self-evident with marketing announcements like “Chipotle Goes Non GMO!” actually being reported in the mainstream nightly news.

Share with your students:

Each year more and more agricultural acres are pulled out of production to be utilized for commercial and housing development, as urban areas continue their sprawl.

The United Nations Food and Agricultural Organization estimates that the world will have to grow 70 percent more food by 2050 just to keep up with population growth.

Ask your students:

Question: In light of the United Nations prediction about world food demand, how will a declining number of agricultural producers with fewer acres in overall production feed a growing population?

Answer: Increasing demands for more food and agricultural sustainability are two key challenges plant pathologists address every day. One of their strategies is the development and use of GMO plants. The Gardens of the Galaxy Virtual Field Trip will take us into the lab and greenhouse of two Arkansas plant pathologists to explore how they are working to address current-day problems.

Sick plants are unhappy plants.

Just as with humans and animals, plants can be infected by pathogens that make them sick. Since humans began practicing agriculture, they have had to deal with diseases on
crop plants. This is important because diseased plants usually yield less food in the form of the fruit, grain or vegetables that they produce. Farmers and consumers can be impacted as food supplies, prices and food quality are affected. Likewise, diseases can alter the appearance of plants and flowers and ultimately kill both crop and ornamental plants.

Plant pathologists are scientists who study the bacteria, fungi nematodes and viruses that cause diseases and how to prevent or deal with plant diseases. Some important ways to deal with plant disease in agricultural or horticultural settings include:

- **Using plants that are naturally resistant.** Plant pathologists and breeders use the natural genetic makeup of plants as their primary weapon in developing crops that can fight off disease. This is the most effective way that we have to control plant disease.
- **Cultural practices in growing plants.** Removal of diseased plant debris, using plants that are best suited for a geographical area or soil type, proper watering and fertilization can all contribute to having healthier, disease-tolerant plants.
- **Controlling organisms that spread pathogens.** Other organisms, especially insects, can serve as vectors of nearly all types of plant pathogens.

There are many other approaches used to combat disease in the field. Plant quarantines and limiting transfer of plant material can help to exclude pathogens from areas where they don’t already occur. Chemical fungicides can be useful in controlling fungal diseases, and insecticides can reduce pathogen vectors. The development of GMO plants has been used in several cases to target specific diseases, such as Papaya ringspot virus in Hawaii.

For more information, see [http://www.apsnet.org/edcenter/K-12/TeachersGuide/Pages/default.aspx](http://www.apsnet.org/edcenter/K-12/TeachersGuide/Pages/default.aspx).

**FACTOID:** The genome is not a static environment.

**What are GM products?**

The World Health Organization defines genetically modified organisms (GMOs) as organisms in which the genetic
material (DNA) has been altered in a way that does not occur naturally. It allows selected individual genes to be transferred from one organism into another, including between nonrelated species. (commonground.com).

Genetically modified (GM) crops have been grown for human and animal consumption since the 1990s (Clive and Krattiger, 1996). The majority of commodity crops grown in the United States are GM crops and include soybeans, corn, cotton, sugar beets and canola. The majority of processed foods in the United States contain at least one genetically modified ingredient as well as nonfood products including cosmetics, soaps, detergents, shampoo and crayons.

**How are crops genetically modified?**

The two most common methods for introducing DNA of interest into a plant are:

1. To use bacteria that naturally transfer DNA into plants. *Agrobacterium* species are very good at introducing their own DNA into plants, and they normally cause disease. Biotechnologists use *Agrobacterium* that has been modified to not cause disease but which can still transfer a gene of interest into a host plant. Once the gene of interest has been transferred, the bacteria are eliminated and a “GMO” plant can be generated.

2. A “gene gun” blasts DNA directly into the plant’s cells. In this system, tiny beads of gold are coated with the DNA of interest, and the biolistic ‘gun’ is used to deliver the DNA into plant cells that are placed in a target zone. Once the DNA is delivered into cells, the cells are selected and used to regenerate whole plants.

**Biotechnology Vocabulary**

**Sustainable Agriculture:**
An integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
• sustain the economic viability of farm operations; and
• enhance the quality of life for farmers and society as a whole."
Source: NIFA/USDA, 2015.

**Functional Foods:**
Foods that are enhanced to provide health benefits beyond basic nutrition

**Gene:**
A unit within an organism that controls traits or characteristics that are inherited and passed along to the next generation; genes are encoded by DNA and organized on chromosomes

**Genetically Modified Organism (acronym GMO):**
An organism whose genetic makeup has been altered using genetic engineering techniques (see also “transgenic”)

**Genetic Engineering:**
The transfer of specific genes between organisms using enzymes and laboratory techniques rather than biological hybridization

**Genetic Code:**
The system of triplet codons composed of nucleotides of DNA or RNA that determine the amino acid sequence of a protein

**Genome:**
The complete genetic information of an organism

**Pathogen:**
A disease-producing organism or biotic agent

**Plant Pathologist:**
A scientist who studies plant diseases, why some hosts are susceptible to them and how to prevent diseases

**Transgenic:**
Possessing a gene from another species; used to describe the organisms that have been the subject of genetic engineering (see also genetically modified organism, GMO)
**Gene Gun:**
A device used to bombard plant cells with metal particles coated with foreign genes to accomplish genetic engineering

**Are GM foods safe? What's all the fuss about?**

The U.S. Food and Drug Administration uses the standard of “substantial equivalence” in deciding whether a food product should be regulated in some special way. For GMO food crops that have been approved, they have been deemed not different in any substantial way from non-GMO versions of the same crop. Establishing substantial equivalence is required for GM crops. The purpose of the test for substantial equivalence is to identify possible hazard areas, which become the focus of further assessment (FSANZ, 2007 and König et al., 2004).

Gregory Jaffe, Director of Biotechnology at the Center for Science in Public Interest, (a science-based consumer-watchdog group in Washington, D.C.) states that the center “has no official stance pro or con, with regard to genetically modifying food plants.” Yet Jaffe insists the scientific record is clear. “Current GM crops are safe to eat and can be grown safely in the environment.” The American Association for the Advancement of Science, the American Medical Association and the National Academy of Sciences have all unreservedly backed GM crops.” (Scientific American, Summer 2015)

“The image of the scientist as magician arises when the experiment is viewed as engaging in unwonted tampering with nature, when he appears to be a menace because he aims to unlock forces of nature which should be ‘left as they are.’”

– Dr. Victor Thomas, Department of History of Science, Harvard University

The fear and distrust of science is nothing new. Despite powerful scientific evidence to the contrary, countries, businesses and restaurants have been banning, regulating and labeling non-GMO products and taking GMO products off their menus.
Kristie Swenson is one of a new generation of farmers who is attempting to bridge the gap between science and consumers. On the website findourcommonground.com farmers communicate digitally to help consumers make food choices based on “fact not fear.”

In Africa, where millions go hungry, several nations have refused to import GM foods in spite of their lower cost (the result of higher yields and a reduced need for water and pesticides). (Scientific American, Summer 2015)

So what’s up with this?

Plants Under Construction

Share with your students:

Genetic selection has occurred since the beginning of time, and selection of improved plants and animals by humans has been part of agriculture since its beginnings some 10,000 years ago.

Home gardeners as well as scientists have produced better plants through conventional crossbreeding. Over the past 60 years “scientists have used “mutagenic” techniques to scramble the DNA of plants with radiation and chemicals, creating mutant strains of wheat, rice, peanuts and pears that have since become agricultural mainstays.” Little objection has occurred to these biotechnology practices, where safety monitoring indicates no known health problems.

The University of Washington developed the first genetically modified (GM) tobacco plant in the 1970s. The first GM crops were released in the 1990s for consumption. The scientific community and foundations such as the Pew Charitable Trust have agreed that there is “overwhelming evidence that GM crops are safe to eat.”

Crops using GMOs currently grown across the United States include soybeans, corn and cotton.
Almost none of the foods we eat would survive in the wild; they have been cultivated and often bear no resemblance to their wild relatives.

- Wheat could not exist outside of farms because its seeds do not scatter.
- Broccoli, cauliflower, Brussels sprouts, cabbage and kohlrabi are mutations of kale.
- Strawberries resulted from accidental, natural crossbreeding after gardeners planted a wild strawberry from the United States and another from Chile next to each other in the Paris Botanical Garden in 1766.

Genetic modification and conventional plant breeding have much in common: both are ways of producing new crops by altering plant genomes.

The differences have to do with:

- The tools that are used
- The number of genes swapped

(GMOs are produced with precise techniques to introduce one or a few specific genes at a time. Traditional plant breeding takes advantage of hybridization and sexual recombination, where thousands of unknown genes are exchanged and recombined in the next generation.)

**Identified benefits of GM crops include:**

- Reduction in farmer cost to produce crops related to labor, tillage and applications
- Transportability and nutritional value of food products
- Reduced environmental impact on soil and ground water
- Increased ability of crops to withstand environmental challenges related to drought, disease and insect infestations/pressure

**New factors figuring into the equation include:**

- The comfort level of the consumer
- Communication of science by nonscientists
- Commercial marketing strategy to promote non-GMO

Biotechnology has accelerated the plant breeding process in support of crop improvements. Plant breeding is the deliberate hybridization of plants to produce desirable traits.
which are selected by the plant breeder. Targeted traits are generally classified as:

- **input traits**, genetic modifications that make insect, virus and weed control easier or more efficient; and
- **output traits**, modifications that offer direct consumer benefits, including functional foods, foods that provide health benefits beyond basic nutrition (Pew Charitable Trust, 2007).

Scientists today use a range of technologies to support selective breeding. The use of transgenic or GMO gene introduction is one tool used to produce plants with improved traits.

**DRAMA ALERT! Mad Scientist Ahead!**

**Science Versus Public Sentiment: What do the critics have to say?**

“Are Engineered Foods Evil?” is the title of a recent article featured in the Summer 2015 edition of *Scientific American*. In his article, University of California-Los Angeles plant molecular biologist Dr. Robert Goldberg laments,

“This is the most depressing thing I have ever dealt with . . . In spite of hundreds of millions of genetic experiments involving every type of organism on earth, and people eating billions of meals without a problem, we’ve gone back to being ignorant.”

Early detractors and skeptics of the use of GM plants included Greenpeace, the Sierra Club, Ralph Nader and Prince Charles.

Anti-GMO groups generally oppose “the process of forcing genes from one species into another entirely unrelated species. Unlike crossbreeding or hybridization – both of which involve two related species and have been done without ill effects for centuries,” detractors charge that “genetic engineering forcefully breaches the naturally-occurring barriers between species” (http://gmo-awareness.com/all-about-gmos/gmo-defined/).
The vast majority of scientists disagree with this statement: “When GM critics say that genes don’t cross the species barrier in nature, that’s just ignorance.” (Alan McHughen, plant molecular geneticist, U.C. Riverside (Scientific American, Summer 2015).

The two most common methods of producing GM crops are through Agrobacterium-mediated transformation and microparticle bombardment (also known as biolistics) (Wilson et al., 2006). A common criticism of these processes is that they are imprecise. Detractors are calling for long-term human and environmental studies to determine the persistence of toxic residues in the plants, on the dinner plate and in the environment.

The anti-GMO organization GMO Awareness states that, “Because the injected genes can come from bacteria, viruses, insects, animals or even humans, GMOs are also known as “transgenic” organisms. Because genes operate in a complex network in ways that are still not fully understood (as discovered during the Human Genome Research Project), genetic engineering can result in both known and unknown/unintended consequences.”

Source: http://gmo-awareness.com/all-about-gmos/gmo-defined/

Detractors of GMOs have been loudest in Europe and other countries who have seemed to follow Europe’s lead. Some scientists believe European rejection of GMOs is more related to a resentment for American agriculture, with the primary result being a trade barrier. The size of American farms dwarfs those of other countries. Other observers have noted that food safety officials in other countries have limited credibility with the public, so any safety assurances are met with skepticism. Kenya, a county with widespread malnutrition, has totally banned GM foods.

Critics in America also point out that much of the research is funded by companies that sell GM seeds and herbicides.

As of September 2015, the Bill and Melinda Gates Foundation has committed more than $2 billion (U.S.) to agricultural development efforts, primarily in Sub-Saharan Africa and South Asia. Investing in GM technology as one of many
strategies, their goal is lofty but clear: to “reduce hunger and poverty for millions of farming families in Sub-Saharan Africa and South Asia by increasing agricultural productivity in a sustainable way.”

Source: http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development

This has created a backlash of harsh criticism from anti-GMO groups.

Nearly 1 billion people worldwide are affected by severe hunger and poverty. Many are farmers who rely on small plots of land (about one to two acres) for their food and income. Our goal is to help these farming families produce more food and increase their income, while preserving the land for future generations.

– Bill and Melinda Gates Foundation

The Million Dollar Question: Who do you trust?

Discuss with your students:

How do you sort the chaff from the grain in our digital world? What is safe?

This is a good question.

Most scientists are quick to point out that safety can never be absolutely determined due to intervening factors.

In the world of science, safety is incrementally measured from minimal to high risk, which almost always depends on other variables and/or mitigating factors.

Television advertisements for prescription drugs forever exploded the myth that doctors can guarantee patients that consumable products are totally safe.

That aside, scientists work to measure and accurately calculate risk so consumers can make informed decisions.
and policy-makers can make defensible decisions without detrimental unintended consequences.

An unintended consequence of a public policy restricting the use of GMOs is the equivalent of deciding how many and who gets to eat on any given day.

No place is this clearer than in Africa where vitamin-enriched GM rice is blocked from entry into certain countries. In many African countries, agricultural producers are subsistence farmers who cannot afford chemicals and fertilizers to protect their crop or increase their yield in harsh conditions.

The production volume and quality of food are two goals for genetic modification of organisms. The initial research in agricultural biotechnology was specifically geared toward “input traits,” genetic modifications to improve insect, virus and weed control. Biotechnology research focusing on “output traits” are focused on consumer benefits. This biotechnology supports the development of “functional foods”: foods that provide health benefits beyond basic nutrition.

The range of functional foods includes oils that produce no trans fats or contain heart healthy omega-3 fatty acids, soy with increased protein content to help fight malnutrition in developing countries and foods with enhanced levels of antioxidants.

In many parts of the world, vitamin deficiencies are a major cause of disease and mortality, especially among children and women of childbearing years.

The Rockefeller Foundation, the Swiss Federal Institute of Technology and the International Rice Research Institute sponsored the research that resulted in Golden Rice. A 2007 report, “Application of Biotechnology for Functional Foods,” by the Pew Charitable Trust notes, “The application of biotechnology to foods expressly to improve nutritional and health characteristics hold great potential.” Nonetheless, Bangladesh and the Philippines stand alone as foreign countries that “have plans to grow Golden Rice, a crop engineered to deliver more vitamin A than spinach does (rice normally contains no vitamin A), even though vitamin A deficiency causes more than one million deaths and half a million cases of irreversible blindness annually in low-income countries.” (Scientific American, Summer 2015).
Suggested Assignments and Classroom Activities:

Challenge your students to explore the evidence and become a part of the conversation . . .

- Assign student teams to assess credible evidence. Schedule a debate/argumentation session with structured scientific argumentation during a class session (statement of a claim, reporting collected evidence, justification of the evidence)
- Provide extra credit opportunities through individual reports involving collection of evidence and critical analysis
- Engage students in identification of science project questions and hypothesis for applied research

The topics below can be used for a range of classroom assignments and activities related to one or more of these contemporary biotechnology issues:

The Food Safety Issue

The U.S. Food and Drug Administration (FDA) requires a full safety evaluation for food products that contain:

- Genes that are not currently present in the food supply
- Foods with altered nutrient levels
- Allergenic products (such as nuts, shellfish, legumes and milk)
- New antibiotic-resistant markers
- Increased level of toxins
- Different composition from substances currently found in food
- Resistance of weeds or insects to GMO crops

Student Question: Are GM foods safe? Do government regulations go far enough to protect food safety, or do they go so far that they inhibit business, research and development? By opposing GM foods, could affluent consumer preferences have unintended consequences for farmers and the world’s most vulnerable populations?
The Labeling Issue

Consumer groups are pushing for legislation requiring the labeling of GMO products in our food.

GM foods are not currently labeled, with the exception of foods with genes derived from organisms that have not traditionally been a food source. Genetic modification is “a process, not an ingredient, so regulations currently do not require labels on GM foods that are essentially the same as the foods currently on the market.” (Biotechnology Institute)

Student Question: Should all GM foods be labeled? If they were labeled, would the public interpret them as a warning or additional information related to the nutritional value of the food?

The Glyphosate Issue

Traditional herbicides cause environmental damage because they are toxic to animals and insects and can persist in the environment.

The Biotechnology Institute, an industry-supported advocacy and education group, identifies the following pros and cons of glyphosate use in crop production:

**PROS**
- Requires a less toxic herbicide
- Saves farmer work and expense
- Makes food cheaper
- Reduces tillage and damage to the environment

**CONS**
- Still requires herbicide use on food
- Sprays contain other ingredients that may cause harm
- Raises public concerns about eating GM crops
- Poses potential risk of superweeds

Student Question: What are the tradeoffs of herbicide-resistant GMOs and conventional crops? Compare direct crop input costs and crop outcomes (comparative yields) in Arkansas between these two groups for specific crops. Describe the key sustainability issues. The two biggest crops in Arkansas are soybeans and rice; what are some reasons that GMOs are currently accepted and used in soybeans but not used in rice?
The Virtual Field Trip and these activities can be used to address the following standards for literacy in science from the Common Core State Standards for English Language Arts and Literacy: Literacy in the Disciplines.

**Biology and Environmental Science**

**Writing**
- Research to build and present

**Speaking and Listening**
- Comprehension and collaboration
- Presentation of knowledge and ideas

The Virtual Field Trip and the classroom activities address the Core Areas and Framework for the Next Generation Science Standards (NGSS):

<table>
<thead>
<tr>
<th>Scientific Practices</th>
<th>Cross-Cutting Concepts</th>
<th>Life Sciences Core Ideas</th>
<th>Earth and Space Science Core Ideas</th>
<th>Physical Sciences</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking questions</td>
<td>Patterns</td>
<td>From molecules to organisms: structures and processes</td>
<td>Earth's systems</td>
<td>Matter and its interactions</td>
<td>Engineering design</td>
</tr>
<tr>
<td>Constructing explanations</td>
<td>Cause and effect: Mechanism and explanation</td>
<td>Ecosystems: Interactions, energy and dynamics</td>
<td>Earth and human activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engaging in argument from evidence</td>
<td>Scale, proportion and quantity</td>
<td>Heredity: inheritance and variation in traits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining, evaluating and communicating information</td>
<td>Systems and system models</td>
<td>Biological evolution: unity and diversity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structures and function</td>
<td></td>
<td>Stability and change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Biological Revolution:  
The era which has seen the rapid development of new technologies for the manipulation of biological processes.

Biotechnology:  
The development of genetically modified organisms through the use of modern technology and processes, including genetic engineering.

Biotechnology-Derived Products:  
Products that are a direct result of a specific biotechnology: soybeans or BT corn.

Cell:  
The smallest structural unit of living matter capable of functioning autonomously. The basic unit of any living organism that carries on the biochemical processes of life.

Chromosome:  
A self-replicating structure consisting of DNA complexed with various proteins and involved in the storage and transmission of genetic information – the physical structure that contains genes.

DNA Sequence:  
The relative order of base pairs whether in a DNA fragment, gene, chromosome or an entire genome.

DNA Sequencing:  
Determination of the order of nucleotides (base sequences) in a DNA or RNA molecule or the order of amino acids in a protein.

Double Helix:  
The twisted ladder shape that two linear strands of DNA assume when complimentary nucleotides on opposing strands bond together.

Ethics:  
Code of conduct that distinguishes between acceptable and unacceptable behavior.

Gene:  
The fundamental physical and functional unit of heredity. A gene is an ordered sequence of nucleotides located in a particular position on a particular chromosome that encodes a specific functional product (i.e., a protein or RNA molecule).
Genomics: The study of the genes of an organism and their function.

GMO: An organism whose genetic makeup has been altered using genetic engineering techniques (see also transgenic).

Input Traits: An input trait helps crop producers increase the efficiency of production. Examples include increased yield, resistance to insects and diseases and more efficient nutrient utilization. Input traits affect how the crop is grown, without changing the nature of the harvested product.

Living Objects: Objects that are a carbon- and water-based cellular form with complex organization and heritable genetic information. Objects that have signaling and self-sustaining processes.

Messenger RNA (mRNA): RNA that serves as a template for protein synthesis.

Never-Living Objects: Inorganic and inanimate objects are not living. Some examples are plastic (petroleum based), metal, rock and glass.

Output Traits: An output trait helps consumers or processors by enhancing the quality of the plant product. Examples are soybeans with heart-healthy oil profiles, soybeans that are designed for specific industry uses, such as generation of biofuels, and crops that contain higher nutrient levels, such as increased lycopene in tomatoes. An output trait changes the quality of the crop itself by altering starch, protein, vitamin or structure or composition.

Plant Breeding: Can be described as both an art and a science that leads to changing genetics of plants in order to produce desired characteristic(s). Plant breeding is done utilizing many different techniques ranging from simple selection of plants with desirable characteristics to more complex techniques utilizing biotechnology.

Protein: A large molecule composed of one or more chains of amino acids in a specific order; the order is determined by the base sequence of nucleotides in the gene that
codes for the protein. Proteins are required for the structure, function and regulation of the body’s cells, tissues and organs, and each protein has unique functions. Examples are hormones, enzymes and antibodies.

**RNA (Ribonucleic Acid):**
A chemical found in the nucleus and cytoplasm of cells – it plays an important role in protein synthesis and other chemical activities of the cell. The structure of RNA is similar to that of DNA. There are several classes of RNA molecules, including messenger RNA, transfer RNA, ribosomal RNA and other small RNAs, each serving a different purpose.

**Recombinant DNA:**
Genetically-engineered DNA prepared by transplanting or splicing genes from one species into the cells of a host organism of a different species. Such DNA becomes part of the host’s genetic makeup and is replicated.

**Replication:**
The process of duplicating or reproducing, as the replication of an exact copy of a polynucleotide strand of DNA or RNA.

**Sustainable Agriculture:**
An integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations; and
- enhance the quality of life for farmers and society as a whole.

**Gene Expression:**
Conversion of the information from the gene (DNA) into mRNA via transcription and then to protein via translation. This results in producing what you “see” or the phenotype of an individual organism.

**Genetic Code:**
The sequence of nucleotides, coded in triplets (codons) along the mRNA, that determines the sequence of amino acids in protein synthesis. A gene’s DNA sequence can be used to predict the mRNA sequence, and the genetic code can in turn be used to predict the amino acid sequence.

**Genetic Engineering:**
Altering the genetic material of cells or organisms to enable them to make new substances or perform new functions.

**Genome:**
All the genetic material in the chromosomes of a particular organism. Its size is generally given as its total number of base pairs.

---

**References**


North Carolina Biotechnology Resources. 2015. Biotechnology Teacher Resources Online. Website: http://www.ncbiotech.org/educational-resources

Orvis, Carroll and Goldsbrough. 2006. *Apple Genomics Project*. Purdue University. Source: www.four-h.purdue.edu/apple_genomics


The Arkansas Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, sex, gender identity, sexual orientation, national origin, religion, age, disability, marital or veteran status, genetic information, or any other legally protected status, and is an Affirmative Action/Equal Opportunity Employer.