



April 2020

## Agricultural Research Partnerships (ARP) Network NOTES

Welcome to ARP Network Quarterly Notes! Our goal is to keep you informed about ARP Network and Agricultural Research Service's current information. We hope that the notes build networking opportunities for businesses to connect with ARP Network Members.

***Please help us spread the word by sharing ARP Network Notes with your company contacts, colleagues, other organizations, etc. Thank you!***

### ARP Network

The ARP Network enlists the help of partners to spark economic development, entrepreneurship and community development. USDA ARS founded the ARP Network to expand the impact of ARS research and provide resources to help companies grow. By combining ARS research expertise with complementary capabilities and talents of partnering organizations, the ARP Network helps stimulate economic growth through technological advancements. The ARP Network matches business needs with ARS innovations and research capabilities and provides business assistant services to help companies and startups solve agricultural problems, develop products and create new jobs. Learn more by visiting us on LinkedIn: <https://www.linkedin.com/in/agricultural-research-partnerships-arp-network-3863a8147>

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### ARS Partnership and/or Licensing Opportunities

ARS is looking for industry partners interested in commercializing these technologies and/or evaluating them for potential commercial applications through a Cooperative Research and Development Agreement (CRADA). Many of these technologies are also available for licensing

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## **An Economical X-ray Based Irradiator with High Dose Uniformity and Precision**

A cabinet style irradiator employing standard commercially available x-ray components in a novel configuration that allows for precise dosimetry in real-time along with unprecedented uniformity of radiation dose among samples.



### ***Benefits***

- Substitute for gamma irradiation using radioisotope-based sources and subsequent reduction in cost, regulations, and safety concerns for operators
- High dose precision and uniformity
- High reliability and proven ruggedness

### ***Applications***

- Insect sterilization for Sterile Insect Control technique
- Irradiation of small samples such as seeds, nuts, grain, sprouts or rice

ARS Docket nos. 38.20. Please contact David Nicholson: [david.nicholson@usda.gov](mailto:david.nicholson@usda.gov)

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## **Use of Nitrogen-Containing Compounds as Plasticizers for Peptide-Based Biopolymers**

A method of reducing the melting point of a peptide-based biopolymer, such as keratin or silk, using a nitrogen-containing compound as a plasticizer.

### ***Benefits***

- The peptide-based processed biopolymers are malleable, digestible and biodegradable
- Using nitrogen-containing compounds as plasticizers lack the problems of using urea or petroleum-based plasticizers

### ***Applications***

- Produce animal feed to increase the adsorption of amino acids (for mammals, fish, birds, amphibians and reptiles)
- Biobased fertilizer
- Biobased substitutes for petroleum-based plastics

ARS Docket No. 104.14 + 120.17. Please contact Jim Poulos: [jim.poulos@usda.gov](mailto:jim.poulos@usda.gov)

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## Multi-Band Photodiode Sensor

A wireless, multi-band sensor effective for measuring plant canopy temperature and multi-spectral reflectance. Also, a process to qualify the temperature data and classify the spectral reflectance measurements for use in irrigation management. The data are used to detect variations in spectral signature due to plant stress (e.g., disease, water stress) and due to soil background and to qualify temperature data accordingly. The data provide information for decision support algorithms related to the initiation of automatic irrigation scheduling as a function of crop canopy cover, qualification of temperature data used in automatic irrigation scheduling algorithms, and detection of diseased crops for the purpose of withholding irrigations when yield potential is compromised.

### *Benefits*

- The multi-band sensor is designed as a single, self-contained unit
- It may be used as a hand-held sensor for measuring crop canopy temperature and spectral reflectance measurements
- It operates continuously with data samples made at regular intervals

### *Applications*

- Could be used as an aide in precision irrigation management of center pivot or lateral move irrigation systems
- Could be used in greenhouse environments and in drip irrigation fields to help monitor plant health against stress and disease

ARS Docket no. 65.09. Please contact Jeff Walenta: [jeffrey.walenta@usda.gov](mailto:jeffrey.walenta@usda.gov)

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## Chromobacterium Species with Insecticidal Activity

A novel species of chromobacterium that selectively kills lepidopteran insect larvae (such as, gypsy moth, diamondback moth, tobacco hornworm larvae, and cabbage looper larvae). The invention includes compositions containing *Chromobacterium spagni* sp. strains and the use of these compositions to kill insect larvae. These compositions kill the indicated larvae at least as well as or better than some *C. subtsugae* biocontrol agents.

### *Benefits*

- Biocontrol agent
- Some species of lepidoptera have become resistant to currently used pesticides. Thus a need exists for new biocontrol agents

### *Applications*

- This invention covers an insecticidal bacterium that can be used to kill lepidopteran insect larvae without harming non-target insect larvae

ARS Docket nos. 58.19. Please contact Jim Poulos: [jim.poulos@usda.gov](mailto:jim.poulos@usda.gov)

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## Method to Enhance the Quality of Wool

An eco-friendly method to improve the photostability of wool products. After treatment, wool fabrics not only exhibit better photo yellowing resistance and UV-blocking ability, but also show slower degradation trends.

### Benefits

- Provides better protection on wool products against UV radiation
- Creates an effective, environment-friendly route to enhance the performance of wool products through a novel process
- Ensures durable protection effects through a novel process

### Applications

- Modification of wool products
- Substitute for traditional treatments
- Enhance the performance and increase the value of wool products

ARS Docket No. 6.20. Please contact Jim Poulos: [jim.poulos@usda.gov](mailto:jim.poulos@usda.gov)

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## Novel Oil Having Antibacterial Activity

Liamocins produced by certain strains of the fungus *Aureobasidium pullulan* have anti-bacterial activity with specificity for *Streptococcus* spp., *Enterococcus* spp., and *Bacillus* spp. The invention includes methods of using the liamocins and compositions containing modified liamocins to kill bacteria. Also included are methods to produce modified liamocins with specific head groups.



### Benefits

- Liamocins are chemically different than conventional antibiotics, and cross-resistance should be minimal. They may be effective for *Streptococcus* infections that do not respond to conventional antibiotic therapy
- The liamocins are produced from low-cost agricultural biomass substrates, particularly pretreated wheat straw

### *Applications*

- The liamocins produced could be used as a dairy cattle dip for prevention of mastitis or as a tropical antibacterial treatment
- In more refined forms, the pharmacologically active component(s) of the liamocins have potential to be incorporated into injectable or oral medicines

ARS docket no. 107.13 + 51.18. *Please contact Renee Wagner:* [renee.wagner@usda.gov](mailto:renee.wagner@usda.gov)

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### **Microbial Detection**

Systems and methods for detecting microbial toxin in food involved in foodborne illnesses. The invention utilizes a cell-based assay to rapidly quantify and differentiate low levels of active microbial toxins using image capturing technology to detect chemiluminescence activated by exposure to microbial toxins.

### *Benefits*

- Provides a system and method for rapid, economical and sensitive detection of bacterial enterotoxins involved in foodborne illnesses
- Could be used for high throughput screening in industrial settings
- Uses stable cell lines rather than live animals or cells from sacrificed animals

### *Applications*

- Detection of active staphylococcal enterotoxin contamination in meat, dairy, eggs and vegetables for promoting food safety and security

ARS Docket no. 191.16. *Please contact David Nicholson:* [david.nicholson@usda.gov](mailto:david.nicholson@usda.gov)

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### **Chlorine Dioxide Gas Releasing Package Insert for Enhancing Microbial Safety of Food and Non-Food**

A novel, biobased package insert that can generate and release chlorine dioxide gas at levels sufficient to inactivate microorganisms on food and non-food products. This insert offers several desirable attributes for commercialization: 1) ease of manufacturing; 2) flexibility of design to manipulate the concentration and the rate of release; 3) economically feasible; 4) simple activation process and application into a package.

### *Benefits*

- Acts as a secondary disinfection treatment against a variety of pathogenic and spoilage microorganisms for post processing of food and non-food products
- The design of the insert can be adjusted to manipulate chlorine dioxide concentration and release rate to meet specific product needs

- Safe, environmentally friendly, easily incorporated into the packaging line and economically feasible

### *Applications*

- This packaging insert is a versatile solution to enhance the microbial safety and the shelf-life of a variety of packaged food and non-food (e.g. medical equipment) products

ARS Docket No. 154.15. Please contact Jim Poulos: [jim.poulos@usda.gov](mailto:jim.poulos@usda.gov)

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## **Methods and Strains for Producing Bioproducts in *Aureobasidium Pullulans***

Methods for producing arabitol-containing liamocin and other bioproducts from novel modified strains of *Aureobasidium pullulans*. The *A. pullulans* strains contain genetic alterations to control the type of liamocin produced and decrease unwanted bio-products and bio-contaminants. Other useful bio-products produced include exophilins, massoia lactone, pullulan and liamocins with other head groups. The bioproducts can be produced melanin-free.

### *Benefits*

- The modified *A. pullulans* produce near 100% arabitol-containing liamocins on an inexpensive carbon sources such as glucose
- The liamocins and other bio-products produced are melanin-free

### *Applications*

- Antibacterial activities of liamocins against certain gram-positive organisms may have potential applications as a veterinary treatment
- Potential chemical feedstock for the synthesis of a variety of products such as biosurfactants and polymers
- Antifouling agent, phytopathogen control agent

ARS Docket no. 74.19 + 69.15. Please contact Renee Wagner: [renee.wagner@usda.gov](mailto:renee.wagner@usda.gov)

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## **Levulinic-capped Estolides**

New and versatile estolide, Levulinic-capped estolides with improved physical properties including oxidative stability, hydrolytic stability, viscosity index, low temperature pour and cloud points and wear protection. Also, environmental benefits such as high renewable content and biodegradability. First generation estolides have been used in a variety of industrial and automotive lubricant applications.



### *Benefits*

- Low temperature, viscosity and thermal properties that exceeds commercial base oils and fluids
- A highly functional base oil
- A starting bio-based oil that can be easily functionalized into a more complex material

### *Applications*

- Passenger car engine oil (crankcase lubricant)
- Base material or starting material for other applications, such as hydraulic fluid, coatings, cooling fluids and inks

ARS Docket no. 61.17. Please contact Renee Wagner: [renee.wagner@usda.gov](mailto:renee.wagner@usda.gov)

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### **Novel RNA Viruses Infecting Ants**

Invasive ant pesticides are usually synthetic chemical compounds, often incorporated in baits. While these compounds can be effective, they are toxic to non-target organisms. Both virus and RNAi pest control strategies are specific to the targeted pest. Viruses have been identified that are very easily spread in the species, and with the right RNAi construct could be used as a biopesticide for the targeted insect.

### *Benefits*

- Small genomes
- Fully sequenced from multiple sites

### *Applications*

- Direct use for biological control for ants
- Potential for combination with other genetic elements

Docket Nos: 13.18 + 24.18. Please Contact Cathy Cohn: [cathleen.cohn@usda.gov](mailto:cathleen.cohn@usda.gov)

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### **Self-Assembling Amphiphilic Peptides**

Self-assembling peptides in combination with infectious and non-infectious proteins used as inhibitors and diagnostic tools in transmissible spongiform encephalopathies and amyloid producing neurodegenerative diseases.

### *Benefits*

- Prion and other neurodegenerative amyloid diseases are difficult to diagnose and fatal. The use of these proteins has potential to serve as diagnostic probes, inhibitors or therapeutic agents



## Applications

- Amyloid detection assays
- Vehicles for targeted drug delivery to beta-sheet rich amyloid proteins
- Neurodegenerative disease therapies

ARS Docket no. 130.07. Please contact David Nicholson: [david.nicholson@usda.gov](mailto:david.nicholson@usda.gov)

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## Antimicrobial Curing Agents for Epoxies

A bio-based epoxy curing agents has been developed that gives the final cured epoxy polymer good antimicrobial activity against both Gram-positive and Gram-negative bacteria. The manufacturing process involves mixing this curing agent with commercial epoxy resins and hardening the mixture at certain temperatures. The resulting polymer coating doesn't contain any small molecular biocides embedded, but instead inhibits the bacteria by mere contact without releasing any reactive agents.

### Benefits

- Renewable
- Inhibits both Gram-negative and Gram-positive bacteria
- Non-volatile and non-migratory
- Good water-resistance

### Applications

- Antimicrobial coatings for public sanitations like public bathroom wall coating, flooring or toilet seat coatings
- Coatings for reception desks, countertop, dining tables or biological lab benches.
- Medicine or food packaging materials
- Cosmetics additives to prevent microbial proliferation
- Polymeric disinfectants used for water treatment

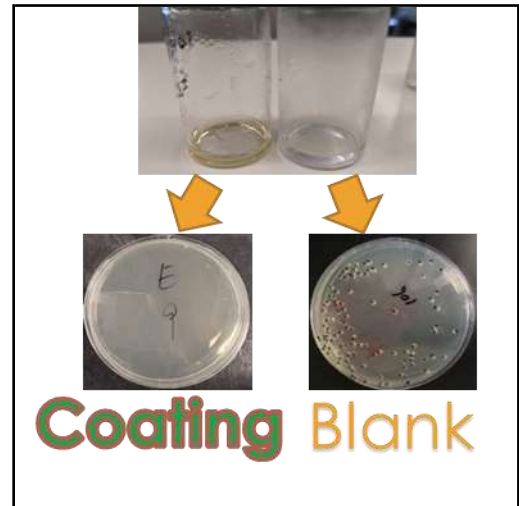
ARS Docket No. 107.19. Please contact Jim Poulos: [jim.poulos@usda.gov](mailto:jim.poulos@usda.gov)

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## Available Technologies for Licensing

Each year, approximately 60 new patents are issued by the U.S. Patent Office for USDA inventions. The Office of Technology Transfer (OTT) transfers these inventions through licenses to the private sector for commercialization. Click [here](#) for a link to *recently filed* U.S. patent applications that are available for licensing.

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## Snapshot of ARS Technology Transfer

A brief information sheet that highlights some ARS Technology Transfer metrics and commercial products resulting from ARS Research. Click [here](#) to read.

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## Resources for Businesses

Some resources for small businesses at USDA and other Federal agencies. Click [here](#) to read.

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## Tellus

**Tellus** is a digital experience that features stories about the cutting-edge work at ARS. **Tellus**, Latin for Earth, reflects the global reach of our efforts to feed a growing population while remaining good stewards of the land. Click [here](#) for the latest articles.



The USDA-ARS Sugarcane Field Station, in Canal Point, FL, celebrates its 100th anniversary this year.

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## ARS Latest News

USDA's ARS is a leading source for U.S. agricultural research. The ARS vision is to lead America towards a better future through agricultural research and information. Click [here](#) for the latest news.

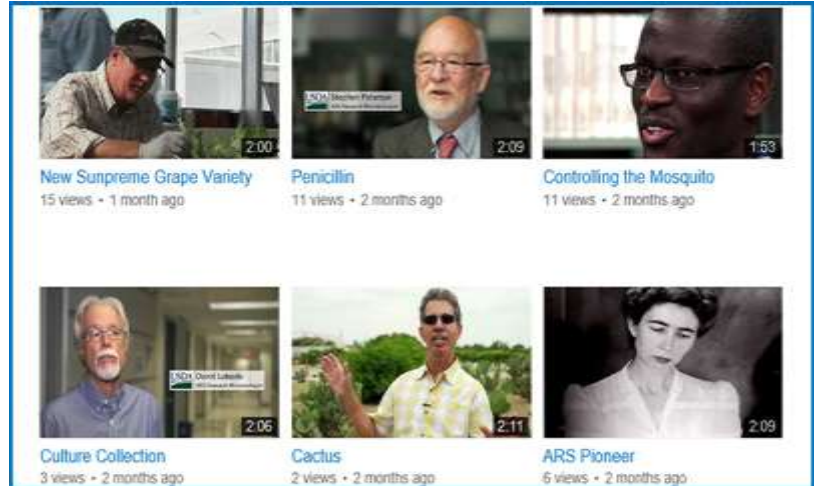


Pima cotton could become an option for some growers in the Texas High Plains as water becomes scarcer. Photo by John P. Brooks.

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## USDA-ARS YouTube Channel

Did you know that ARS is on YouTube? Explore our new YouTube channel to see how our research touches your life: [USDA-ARS YouTube Channel](#)



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## ARS

The Agricultural Research Service (ARS) is USDA's primary internal research agency. ARS conducts research to develop and transfer solutions to agricultural problems that are both national and international in scope. ARS has nearly 2,000 scientists nationwide and a few in overseas locations. ARS scientists carry out 690 research projects on a variety of subjects. ARS has a Congressional mandate to disseminate the research findings of these projects to the American public and other interested parties. Learn more by visiting: <http://www.ars.usda.gov>

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