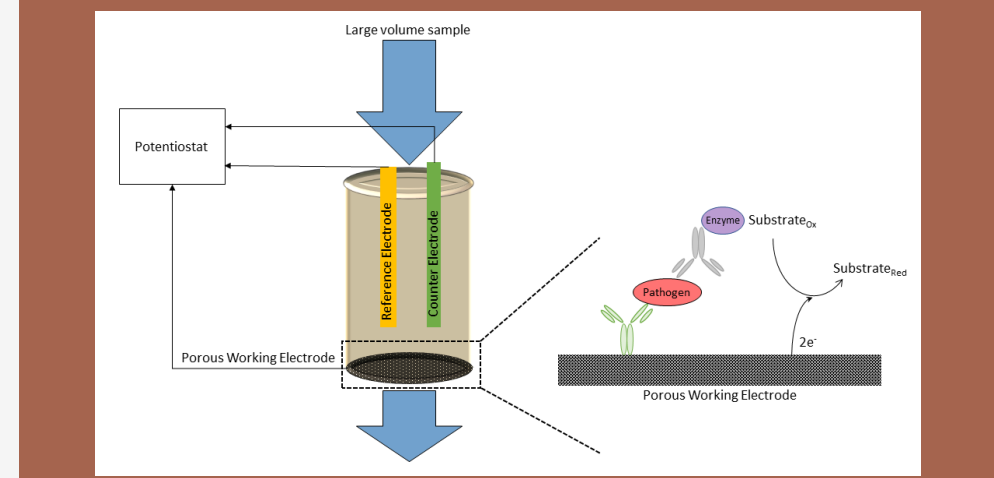


# Flow-Through Immuno-electrochemical Sensor

A novel platform sensor for the selective detection of targeted microorganisms, nucleic acids, proteins, or chemicals in complex mixtures. Unlike most systems, this detection device is capable of handling large volume samples because of the porous nature of the capture surface. The device provides an unmet need for a rapid, portable, accurate sensor by addressing specific limitations associated with the current state of the art used by both industry and regulators.

Docket No: 21.18 & 1.21

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- Detection can be performed with sample volumes that are typically too large to be used with other molecular detection platforms
- Rapid: total assay time of ~4 hours
- Customizable: user defined oligonucleotides or antibodies can be applied
- Economical: can offer significant cost savings

## Applications

- Detection and quantification of pathogens, spoilage organisms, toxins and/or biomarkers of interest
- Demonstrated applications using large volume liquid samples and ground meat homogenate

# Bacteriophage-Based Electrochemical Biosensor

A biosensor using bacteriophages in a sandwich-assay system for rapid detect of foodborne pathogens (i.e. Shiga-toxin producing *Escherichia coli*, STEC). The capture element includes a substrate and a bacteriophage. The detection element includes a bacteriophage and a signal amplification element. The target bacterium is sandwiched between the capture element and the detection element, and a quantifiable signal may be generated to measure the amount of bacteria in a sample. The biosensor uses direct sensing to detect the bacteria in the sample as opposed to indirect sensing methods.

Docket No: 126.17

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)

## Benefits

- Hand-held and portability for on-site rapid analysis and detection of significant groups of foodborne pathogens and toxins
- The sandwich assay uses direct sensing to detect the bacteria in the sample as opposed to indirect sensing methods
- Biosensors overcome the limitations of traditional foodborne pathogen detection such as tedious and time consuming by providing reliable, specific and highly sensitive platforms with shorter turnaround times
- Bacteriophages possess excellent host selectivity attributes

## Applications

- To improve the screening and detection methods of foodborne pathogens in food and environmental samples, thus reducing foodborne illness, hospitalization and economic loss through safe foods

# Synergistic Anti-browning-Antimicrobial Composition

A synergistic antibrowning-antimicrobial solution to kill foodborne bacterial pathogens on produce surfaces and inhibits browning of fresh-cut apples. The solution consists of several compounds generally regarded as safe (GRAS), and would not pose any food safety hazards.

*Docket No: 52.19*

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Kills bacterial pathogens and slows browning in fresh-cut fruits
- A single solution with dual purpose (sanitizer and anti-browning activity)
- Can also be sprayed on fresh-cut fruits instead of submersion
- Safety GRAS ingredients as a minimal processing aid for fruits and vegetables
- Solution is stable at room or refrigeration temperature

## Applications

- Provides microbial safety of fresh-cut fruits

# Novel Methods of Compositions to Evaluate and Determine Inactivation of Hazardous Biological Materials

Assays to determine that foodborne bacterial pathogens and other hazardous biological materials are adequately inactivated in food products. These assays/kits are time-temperature integrator assays that determine the inactivation of microbial food safety hazards in samples by quantifying the degradation of mitochondrial DNA using qPCR.

*(Life Sciences)*

Docket No: 42.13 + 61.20

Contact: [Tanaga.Boozer@usda.gov](mailto:Tanaga.Boozer@usda.gov)

## Benefits

- Quantitative and sensitive test
- Results obtained in 3 - 6 hours instead of days or weeks
- Continuous and rapid monitoring
- Assay food products directly

## Applications

- Safety monitoring of thermally or microwaved processed fruits and vegetables
- Assay kits to evaluate and/or determine the amount of inactivation of biological material in food products and objects (e.g. reusable medical and dental devices)
- Evaluate inactivation protocols and deviations in processing to reduce the amount of viable biological material in or on items

# System for Cleaning Fresh and Fresh-Cut Produce

A system and method for cleaning and sanitizing fresh-cut produce. The approach is to use an upwardly-directed spray, with one or more water jets of sanitizer solution, to remove organic exudate foreign materials and microorganisms from fresh-cut produce immediately after the produce exits the cutter blades. The system is designed so that as the produce falls, it is impacted, reoriented, cleaned, and/or sanitized by the produce-washing liquid.

Docket No: 42.19 + 161.15

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)



## Benefits

- Minimizes the use of chlorine (or other sanitizers) and reduces the volume of water used

## Applications

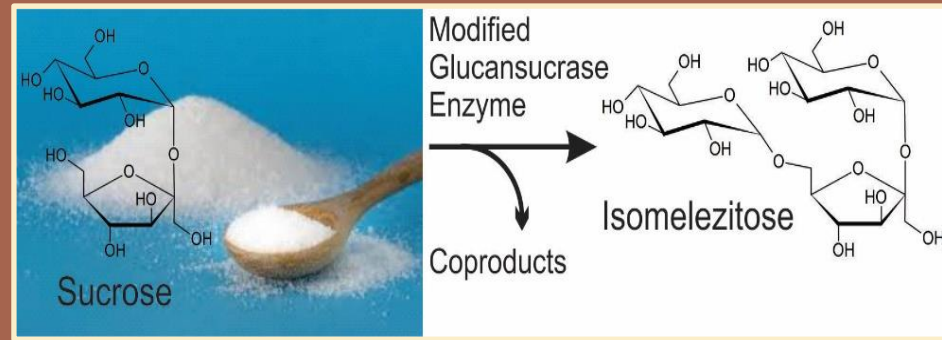
- A system and method to quickly and efficiently remove organic exudate, field debris and soil particulates from freshly-cut produce

# Enzymatic Synthesis of a Novel Bioprotectant

ARS has engineered an enzyme to produce high yields of a rare sugar, called isomelezitose. Similar types of sugars, such as trehalose, are known to have bioprotective properties that minimize damage to proteins from heat, freezing, or drying; and are therefore extremely important to the pharmaceutical, agricultural, and food industries. Isomelezitose was originally found in trace amounts in honey, but efforts to produce this compound were hampered by inefficient synthesis methods. This technology allows this valuable sugar to be produced in commercial quantities.

Docket No: 19.16

Contact: [Renee.Wagner@usda.gov](mailto:Renee.Wagner@usda.gov)



## Benefits

- High product yield from a simple enzymatic conversion inexpensive sugars
- Demonstrated ability to maintain bacterial viability when added to cultures during drying

## Applications

- Improved long-term stability of foods, drugs, vaccines, cells and bacterial cultures
- Potential prebiotic food ingredient for improved intestinal health
- Low-calorie, sweetener that does not promote tooth decay

# Micro-Fluidic Mixer and Method of Determining Pathogen Inactivation Via Antimicrobial Solutions

An automated micro-fluidic device and method to determine whether sufficient free chlorine is present in a wash solution to inactivate a target pathogen.

*(Electronics & Hardware, Life Sciences)*

Docket No: 112.14

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- The device can determine whether sufficient free chlorine is present in wash solution to inactivate a target pathogen
- It can determine the time and dose-dependent response of pathogen inactivation via free chlorine in times as short as a few seconds or less

## Applications

- Use in the produce washing industry to determine the minimum free chlorine concentration needed to prevent pathogen survival/cross-contamination when washing fruits and vegetables
- Applications in food, agriculture, pharmaceuticals, and other biological fields. Examples: chemical reaction kinetics study during drug development and microbial challenge studies during the development of new sanitizers and anti-microbial agents for food and human usages

# Methods for Preparing Phenolic Branched Chain Alkyl Fatty Acids or Esters Thereof and Methods for Killing Microorganisms

Methods for preparing plant derived phenolic branched chain fatty acids and methods for using them to kill microorganisms.

*(Life Sciences, Medical-Health)*

Docket No: 101.18 + 47.15

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Sustainable since phenolic and fatty acids are natural compounds

## Applications

- Antimicrobials to improve microbial food safety
- Alternative to bleach
- Value added by-products of agricultural processing
- The crude phenolic branched-chain fatty acid mixtures do not have unpleasant odor



# Electrospun Casein Fibers and Fibrous Membranes

Methods of forming a fiber mat, involving forming an aqueous solution of at least one protein, at least one polysaccharide, and optionally a plasticizer, and electrospinning the aqueous solution onto a collector to form a mat. Creates electrospun fibers from food proteins by using a food-grade polysaccharide to facilitate molecular entanglement in solution and which required no treatments prior to electrospinning.

*(Life Sciences, Materials)*

Docket No: 42.18 + 204.13

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Allows inclusion of micronutrients, heat sensitive bioactives, probiotic/prebiotic blends into functional beverage and food formulations
- The texture and nutritious compositions can be tailored by the inclusion of nutrients during electrospinning or by altering operating conditions

## Applications

- New types of foods based on dairy and other food proteins
- Potentially could be used to produce energy dense foods; foods to create satiety to fight obesity through loading of sensitive compounds known to curb hunger; foods for enhanced delivery or time-release of nutrients such as vitamins, antioxidants, minerals, lipids and bioactive peptides; deliver enhanced flavors or textures; tailoring of the bioavailability of foods; foods for medical use; the development of edible sensors; and casein-based non-food materials, such as new fabrics

# 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.

Docket No: 154.15

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

**3-layer insert**



**5-layer insert**



## 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

# Use of Phyllosphere Associated Lactic Acid Bacteria as Biocontrol Agents to Reduce Bacterial Growth on Fresh Produce

The use of phyllosphere-associated lactic acid bacteria that demonstrate inhibitory effects on the growth and maintenance of human pathogens, such as *Salmonella enterica*, on the surface of food products, particularly fresh fruits and vegetables.

*(Environmental, Life Sciences)*

Docket Nos: 76.14

Contact: [David.nicholson@usda.gov](mailto:David.nicholson@usda.gov)

## Benefits

- Bacteria are applied in liquid or freeze dried powder forms onto food surfaces or agricultural environments that are already contaminated with pathogenic bacteria
- Treatment of produce can take place either pre- or post-harvest
- Easily implemented, low cost solution

## Applications

- Could be used to eliminate prevalent food-borne pathogens
- Bacteria could also be used to decontaminate food processing environments and machinery as part of a normal sanitization process.

# Bacteriocin With Novel Activity

An isolated and purified bacteriocin, thermophilin 110, produced by *Streptococcus thermophiles* strain 110 that kills and/or inhibits the growth of *Streptococcus pyogenes*, *Streptococcus mutans*, and/or *Propionibacterium acnes*. Thermophilin 110 is the first bacteriocin identified with this activity.

*(Life Sciences, Medical-Health)*

Docket No: 102.14

Contact: [Jim.Poulos@usda.gov](mailto:Jim.Poulos@usda.gov)

## Benefits

- Natural, antimicrobial peptides

## Applications

- Applied topically, orally, or parenterally to an animal to prevent the growth of or kill *S. pyogenes*, *S. mutans*, and/or *P. acnes* and thus prevent or treat diseases caused by the bacteria
- Potential for food and non-food applications
- Biopreservative

# High-Affinity Monoclonal Antibodies for Botulinum Toxin Type B

Patent no. 8,900,824, High affinity antibodies for binding epitopes of Botulinum neurotoxin (BoNT) serotype B and hybridomas that produce such antibodies.

*(Life Sciences)*

Docket No: 14.15 +191.09

Contact: [David.Nicholson@usda.gov](mailto:David.Nicholson@usda.gov)

## Benefits

- Quantitative and sensitive test
- Results obtained in 3 - 6 hours instead of days or weeks
- Can detect picogram quantities of toxin
- Used to develop very sensitive, rapid and highly specific immunoassays

## Applications

- Used to develop a sandwich ELISA-based test for detecting BoNT/B