Biosensor Discussion

IFSH Food Safety Research and Potential Areas for Biosensors

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Topics for Discussion

• IFSH and FDA Collaborative Research in Food Safety
• Potential Applications of Biosensors
• Challenges
IFSH – At a Glance

• Four research centers with primary focus on:
  – Food processing safety
  – Nutrition research
  – National security related to food

• Holds consortium between IIT/FDA/Industry (65 Members)
  – Location for FDA’s Division of Food Processing Science & Technology

• 100+ Scientists 50/50 IIT/FDA
• 139 IIT Graduate Students (fall 2016)
  – Masters and Professional Certificates in FST and FPE
  – Students gain valuable research experience with FDA on research projects
IFSH Centers

- U.S. FDA DFPST/CFSAN
- Institute for Food Safety and Health
- School of Applied Technology
  - National Center for Food Safety and Technology
  - Center for Processing Innovation
  - Center for Nutrition Research
  - Center for Specialty Programs
  - Department of Food Science and Nutrition
IFSH & Industry Collaboration

Smuckers

LifeForce

HARMLESS HARVEST

P.F. Chang's

E3 Organics

Leatherhead

Michigan Research Institute

Illinois Institute of Technology
IFSH/NCFST Research Platforms

• Longstanding cooperative agreement with FDA
• Over 30 active collaborative research projects with FDA in:
  – Food Processing & Packaging
  – Food Microbiology & Virology
  – Food Chemistry and Allergen
  – Proficiency Testing and Methods Validation
  – Nutrition
Food Microbiology

- Expert knowledge on *Clostridium botulinum* and other sporeformers
- Expert knowledge on bacterial and viral pathogens
- Risk management options for fresh produce
- New molecular tools for studying microbial resistance
- Sample preparation and detection techniques
- Detection and decontamination methods for food defense, biological threat agents
Food Chemistry and Allergens

• Chemistry
  – Toxins, pesticides, residues
  – Arsenic, heavy metals
  – Effects of processing on constituents
  – Analytical support to nutrition
  – Hot topics (e.g., furan, melamine, etc.)

• Allergens
  – Cleaning and validation
  – Cross-contact
  – Industry survey
  – Effects of processing on antigenicity and allergenicity
  – Allergen/epitope structural characterization
Food Processing and Packaging

**Processing**

- Thermal
- High Pressure
- Cold Plasma
- Microwaves

**Packaging**

- New technologies and tools for validating packaging integrity
- Models for predicting migration of contaminants through packaging
Potential Biosensor Applications in Food Safety/Quality/Nutrition

- Detection of foodborne pathogens
- Detection of chemical hazards, pesticide residues, mycotoxins, allergens, etc
- Food processing process control/monitoring
- In-pack food safety/quality sensing
- Nutritional markers
Considerations for Biosensors
Detection Methods

• Performance criteria
  – Sensitivity
  – Specificity
  – Sample preparation
  – Interference of food/sample matrices
  – Rapidness

• Method Validation
Challenges - One vs Billion

1 ppb = one cent in $10 million

1 *Listeria* in 25g of food
= A golf ball in cubic mile of garbage