CPS CENTER for PRODUCE SAFETY

CPS GRABIT AWARD AND INNOVATION CHALLENGE

Grower's Risk Assessment Biomarkers Investigative Tool, or **GRABIT**

Applications – Due by 12:00 noon PDT on Monday, April 22, 2019

WHAT: The Center for Produce Safety extends an invitation and opportunity for technology innovators and developers to submit their solutions-based discovery to the new award-based challenge grant called **Grower's Risk Assessment Biomarkers Investigative Tool**, or **GRABIT**. The GRABIT challenge was designed to stimulate science-based approaches supporting the broader critical knowledge needs in produce safety risk identification, risk intervention, and high-density data development associated with the domesticated animal–specialty crop interface and, as yet, inadequately defined proximity zones. (Specialty crops include vegetables, fruits, and tree nuts.) CPS anticipates that the outcomes of this competitive award-based innovation and development challenge will include a diverse set of grower-oriented and, ideally, on-farm deployed tools—from solid proof-of-concept to pre-commercial beta–test ready kits. The GRABIT challenge is the first of a multipart effort CPS has undertaken to address the priority research needs of the fresh produce supply and marketing chain.

NEED: Multiple potential risk factors at the domesticated animal–specialty crop interface and transition zones can result in the transfer of foodborne pathogens to fresh-consumed crops. The earliest conceptual development of Good Agricultural Practices guidance booklets, as early as 1995 included management of the potential for zoonotic pathogen transfer, by various modes and vectors, as a key element to sound food safety systems. Over the next two decades, the industry and public health agencies struggled to define sound science-based guidance, standards, and specific risk-based metrics for the essential criteria defining setback and separation distances between these two important agricultural enterprises. In addition to the historical agricultural practices associated with small and mid-sized diversified farming, various geo-economic and land-utilization factors, water availability, and urban development have often resulted in intimate proximity of domesticated animal production and specialty crop production, including fresh-consumed fruits and vegetables.

Recent leafy greens outbreak events have once again highlighted the consequences, and uncertainties, surrounding the risk potential and farm-specific risk exposure of such proximity. Research-derived knowledge to establish or modify any minimal setback or multi-component separation standards to minimize public health risk and protect the integrity of regional and national commodities and related minimally-processed products remains limited. Several key factors limit a broad and geographically diverse assessment of risk using the currently available research tools. For example, it is economically and logistically impractical to deploy appropriate and sufficient bioaerosol capture devices and other supporting analytical equipment and sampling technologies to the diverse situations of concern. These range from high density animal operations to smaller and seasonal facilities and recreational or hobby-ag-training (4H, FFA) animal corrals. Addressing these critical issues in one location, region, commodity, and domesticated animal type and system will not satisfy the knowledge needs nor the CPS mission.

Therefore, an immediate priority for CPS is to stimulate and foster diverse innovations, with the focused goal of identifying a portfolio of promising on-farm deployable tools to monitor, investigate, and map the transfer of

risk-relevant biomarkers from domesticated animal operations to adjacent specialty crops. Initially, lettuce and leafy greens are the most relevant crop systems for adoption. **These on-farm biomarker(s) detection platforms are <u>not</u> to include pathogen-specific biomarkers or genetic virulence factors for human pathogens.** The biomarker(s) detection output is only a reporter system for evidence of chronic or acute transfer of factors from a domesticated animal point source, **without attribution for viable pathogen transference and persistence**. A quantitative or semi-quantitative positive biomarker(s) detection should only be an action directive for more detailed mapping with the GRABIT tool to further define the impacted areas and, potentially, the implementation of industry standard pathogen detection sampling regimes or an alternative harvest decision mechanism.

CRITERIA: CPS has identified that diverse existing or identifiable components to address this GRABIT concept are available among talented researchers and groups already working in this space, although not necessarily focused on fresh produce needs and applications. To ensure a wide and diverse field of innovation, CPS will not define the specific theoretical pathways to acceptable and desirable GRABIT kits and platforms. However, the elements of an effective GRABIT demonstration (and for most likely award consideration) include the following attributes, along with rank guidance for reviewers (i.e, the first criterion receives greater attribute points):

- Operator complexity: Low skill – Medium skill – High skill
- Time to detection report-out: 1–2h to 16–24h
- Location of sample processing: At-farm to Third-party lab
- Sensitivity: High – Medium-high – Acceptable
- CAFO/AFO specificity: Multiple animal – Ruminant animal – Cattle/Dairy-specific
- Biomarker array: Multiple/Redundant – 3–5 Index classes – Single biomarker
- Commercial fit: Prototype/Beta-test ready – Kit format needed – Concept validated
- Cost per test: Low – Medium – High
- Total cost to deploy: Low – Medium – High
- Kit/Platform shelf life: >1 year – 6–11 months – <5 months

CPS seeks to stimulate and identify the broadest set of grower-directed options by defining various award and recognition categories. Based on the combination of ranking factors, many GRABIT design attributes and performance combinations may be successful. A single lowest rank for any single attribute is unlikely to be disqualifying; there are multiple pathways for successful award recognition and further concept development.

There are no limitations to the design of sampling or detection a GRABIT innovator may deploy. However, the background research that CPS has assembled makes it clear that each entry should be designed to fulfill these minimum format expectations:

- Simple to deploy
- Relatively low cost per test
- Accurate and reasonably attributable to the source: differentiates diverse domesticated animal analytes from background environmental interference
- High sensitivity or differential sensitivity relative to biomarker abundance
- Ease of miniaturization
- Potential for on-farm readout (positive signal detection on simple devices/handheld), although the design need for final detection in a qualified lab is not excluded
- Digital data readout format for ease of “heat mapping” fields or regions and potential for interchangeable distributed ledger data consolidation and sharing.

Without limiting the approach or innovation, CPS foresees opportunities to rapidly develop GRABIT concepts or beta–test ready kits, including but not limited to the following scope of diverse existing technologies and applications:

- Nanomaterial-modified paper-based biomarker detection
- Graphene electrochemical biosensor films and fabrics
- Electrospun carbon nanofibers, nanospikes, films, and ornamented conducting fabrics
- Microfluidic paper analytical pads (µPADs)
- Biomarker immobilizing hydrogels

ANTICIPATED USE: There are multiple modes of deployment and anticipated applications for one or more successful GRABIT concepts. For example, a simple and low-cost on-farm biomarker(s) kit is anticipated to encourage baseline definition and monitoring during seasonal crop development, and incremental sampling and detection-mapping according to spatial proximity to domesticated animal facilities, wind direction and velocity variables, climatic/weather events, and other factors. With time and experience, or by the nature of farming perishables, a grower, and handler, may decide to plant a crop, such as leafy greens, closer to a domesticated animal facility than currently allowed by industry standards. Proximity will dictate the number and spatial deployment of the GRABIT kit as crop maturity increases. Ultimately, the absence of scientifically valid biomarker(s) in a well-saturated mapping scheme should support confidence in a positive harvest decision.

Ideally, a GRABIT kit will be agnostic to commodity, domestic and global region, and scale of operation. Ideally, cooperative deployment of the developed platform will encourage data sharing on a regional basis to develop understanding of biomarker dispersal and deposition in a less precise but far broader soft-mapping outcome and to assist in more targeted research-based studies of setback requirements.

2019 TIMELINE

- **April 22, 12 noon PDT** - Submissions due - Five-page narrative describing the innovation and proof of concept or alpha-test proof of functionality
- **May 8** - Selection of 25 finalists
- **May 22-23*** - Shark Tank finalist presentations to review panel – Video Conference
- **June 18-19*** - Awards announced at CPS Symposium, and Flash Presentations by top three or four awardees during the symposium.

*By invitation only. If applicant receives this invitation, they are required to participate and attend to receive award

AWARDS AND OPPORTUNITY:

Award Structure - Up to $500, 000 available**		
Prime Time Ready	**Solid Proof of Potential**	**Promising Proof of Concept**
4 @ $75,000	**5 @ $30,000**	**5 @ $10,000**

**Not all categories may be awarded; awards will be based on merit and industry readiness

CPS will showcase awards through media and events.