The Department of Homeland Security (DHS)
Notice of Funding Opportunity (NOFO)
Countering Weapons of Mass Destruction: Academic Research Initiative (ARI)

NOTE: If you are going to apply for this funding opportunity and have not obtained a Data Universal Numbering System (DUNS) number and/or are not currently registered in the System for Award Management (SAM), please take immediate action to obtain a DUNS Number, if applicable, and then to register immediately in SAM. It may take 4 weeks or more after you submit your SAM registration before your registration is active in SAM, then an additional 24 hours for Grants.gov to recognize your information. Information on obtaining a DUNS number and registering in SAM is available from Grants.gov at: http://www.grants.gov/web/grants/register.html. Detailed information regarding DUNS and SAM is also provided in Section D of this NOFO.

A. Program Description

1. **Issued By**
   U.S. Department of Homeland Security (DHS) Countering Weapons of Mass Destruction (CWMD) Research and Development Division

2. **Assistance Listings (formerly Catalog of Federal Domestic Assistance (CFDA) Number)**
   97.077

3. **Assistance Listings Title (formerly CFDA Title)**
   Homeland Security, Research, Development, Testing, Evaluation, and Demonstration of Technologies Related to Nuclear Threat Detection

4. **Funding Opportunity Title**
   Countering Weapons of Mass Destruction: Academic Research Initiative (ARI)

5. **Funding Opportunity Number**
   DHS-21-CWMD-077-001

6. **Authorizing Authority for Program**
   Homeland Security Act of 2002, 6 U.S.C. §§ 101, 592 (a)(6), 596 (amended 2018) *as construed by* Countering Weapons of Mass Destruction Act of 2018, Pub. L. No. 115-387, 132 Stat. 5162, 5166 § 2(b)(2) (2018).

7. **Appropriation Authority for Program**
   Consolidated Appropriations Act, 2021 (P.L. 116-260), Division F – Department of Homeland Security Appropriations Act, 2021, Countering Weapons of Mass Destruction Office, Research and Development.

8. **Announcement Type**
   Initial

9. Program Overview, Objectives, and Priorities

Overview

The U.S. Department of Homeland Security (DHS) is committed to using cutting-edge technologies and scientific talent in its mission to make America safer. On December 21, 2018, the Countering Weapons of Mass Destruction Act of 2018, (Pub. L. No. 115-387) was signed into law, amending the Homeland Security Act of 2002, to establish in the Department of Homeland Security (DHS) the Countering Weapons of Mass Destruction (CWMD) Office (CWMD) by consolidating the Domestic Nuclear Detection Office (DNDO) and a majority of the Office of Health Affairs (OHA). The mission of CWMD is to counter attempts by terrorists or other threat actors to carry out an attack against the United States or its interests using a weapon of mass destruction, as well as to protect the United States its people, and interests, against other chemical, biological, radiological and nuclear threats. The DHS CWMD Research and Development (R&D) appropriation provides resources necessary to identify, explore, and demonstrate new technologies and capabilities that will help enable the DHS and stakeholders to prevent, protect against, respond to, and mitigate nuclear, chemical, radiological, and biological threats and incidents. The CWMD ARI program addresses the security, prevention and protection per the Presidential Policy Directive #8 (PPD-8) by seeking novel cross-cutting research that will enhance national security's capability to detect and prevent the illicit entry, transport, assembly, or potential use within the United States of unauthorized chemical, biological, radiological, or nuclear (CBRN) materials, devices or agents and otherwise help protect against an attack using such materials, devices, or agents.

Objectives

The ARI Program has two primary objectives: 1) Engage the academic community to advance fundamental knowledge for CBRN sciences applicable to Countering Weapons of Mass Destruction (CWMD) with emphasis on fundamental research to solve long-term, high-risk challenges; and 2) Develop human capital for the CBRN science and engineering professions. Furthermore, the program works to sustain a long-term commitment to basic research in these fields and coordinates research efforts across the federal government.

Priorities

Each grant application will be evaluated based on the criteria provided in Evaluation Criteria under the Application Review Information section. The research topics in this announcement will address technical challenges in order to enable increased capability to detect, identify, and notify about CBRN threats. The full solicitation research topics are listed in **Appendix A**. Summaries of the topics are as follows:

- Topic Area 1 (TA-01): *MicroRNA as Biomarkers for Early Biothreat Detection*: Improve the understanding of microRNA (miRNA) as a tool in early detection and diagnosis of biothreats. Focus areas may include research on how changes in miRNA packaging and/or expression levels can affect miRNA functionality, as

well as whether individuals or animals exposed to biological agents have different expression profiles of circulating serum miRNA compared with controls. Research should seek to use miRNA expression profiles towards development of early prediction, detection, diagnosis, and/or monitoring methods, of biothreats with focus on biological agents of security concern.

- Topic Area 2 (TA-02): *Chemical, Biological, or Radiological/Nuclear (CBRN) Area Detection and Analytics*: Develop a broad-area sensing array approach for CBRN threat detection and tracking before, during, and after a high-profile event. Collect baseline data for application of analytical tools, during the present project and for future efforts. Develop methods to detect and remediate induced bias in threat detection algorithms.

- Topic Area 3 (TA-03): *Technology Component Improvement for Neutron-Based Active Interrogation*: Develop advanced technology components for improvements of active interrogation systems using neutrons to detect threats such as special nuclear material (SNM), explosives, and illicit drugs for DHS applications. Focus areas may include: detection algorithms; specific software tools to support the detection algorithm; simulation and detection studies to inform advanced detector implementation; studies of threat material signatures; or determination of neutron source requirements.

Expected Outcomes

The topics listed in Appendix A have defined overall project goals. These are developed to push the state-of-the-art in the performance, cost effectiveness, and/or operational risk reduction in the detection, identification, and tracking of CBRN threats. Proposal submissions must clearly define intermediate targets and goals (quantitatively as much as possible) for each budget year.

Progress toward goals will be a consideration for continuation during project evaluation, in addition to project costs and schedule. Project evaluation includes, but is not limited to, information provided during three project reviews during the year, as well as monthly and annual reporting.

In accordance with the Office of Management and Budget Memorandum M-20-12, these outcomes support effective program evaluation. The outcomes provide information that is relevant to the CWMD mission and strategic plans and conveyed in an actionable manner to inform stakeholder buy-in, program improvement, and budget planning. The Program Managers in CWMD assessing the outcomes for the program evaluations are Subject Matter Experts in CBRN related fields who will provide an objective, ethical, and independent evaluation of the outcomes.

Program Structure

<u>Project Budget</u>

It is understood that as the project matures, additional funding from the applicant may be necessary for development. Additionally, time may be required to recruit students to work on the project. The proposed budget should be structured to account for these considerations.

10. Performance Measures

Project Metrics

The ARI Program requires reporting of various project metrics to allow for adequate project oversight. These metrics will be reported during any project review and submitted reports. Templates for reporting will be provided after awards are made. These metrics include:

1. Progress toward intermediate project specific targets and goals in advancing fundamental knowledge for CBRN sciences applicable to CWMD;
2. Student participation reported as number of graduate and undergraduate students who are directly supported (funded) or involved in the project;
3. Number and types of peer reviewed and non-peer reviewed publications (e.g., journal article; conference oral or poster presentation; book or book chapter; thesis/dissertation; fact sheet); intellectual property developed (patents, copyrights, trademarks, licenses); and awards in recognition of technical achievement (e.g., best paper or poster; R&D 100); and
4. Financial status for work in progress.

B. Federal Award Information

1. **Available Funding for the NOFO:** $5M

2. **Projected number of Awards:** 8-11

3. **Period of Performance:** Up to 60 months

DHS anticipates the period of performance of awards with duration up to 60 months. DHS anticipates each program year will be 12 months. **Extensions – Refer to Section H**.

Projected Budget Period of Performance Start Date(s): 09/01/2021

Projected Budget Period of Performance End Date(s): 08/31/2022

4. **Projected Period of Performance Start Date(s):** 09/01/2021

5. **Projected Period of Performance End Date(s):** up to 60 months

6. **Funding Instrument Type:** Cooperative Agreement

The Program Office will have substantial involvement in the administration of the award(s) including tracking research progress toward defined objectives and goals, funding levels and expenditures, and tracking of project publications, patents, and student participants. The recipient will be required to maintain close and regular interaction with the Program Office, including: a) meetings 3 times per year at recipient site, CWMD office, virtually, and/or a neutral site (such as industrial partner): b) monthly teleconferences (roughly 1 hr) to report on progress (including financial status); and c) an annual report that details the work completed in a given year.

C. Eligibility Information

1. Eligible Applicants

The following entities below are eligible to apply for this NOFO*:*

- Private institutions of higher education
- Public & State controlled institutions of higher education

2. Applicant Eligibility Criteria

Organization Limit. The following listed below are organizations that are eligible and encouraged to submit a proposal:

- Universities and Colleges. Universities and two- and four-year colleges (including community colleges) accredited by a U.S. Department of Education recognized accrediting agency, and having a campus located in the U.S;
- Organizations are referred to as academic institutions for the purposes of this Solicitation.

  All non-academic institutions regardless of profit or non-profit status are ineligible to participate.

  Principal Investigator (PI) Limit. None Specified

  Limit on Number of Proposals per Organization. None Specified

  Limit on Number of Proposals per PI. One (1). Furthermore, an individual researcher may not be named as a participant on more than one proposal submitted to this Solicitation. This limitation includes participation as a PI, co-PI, senior researcher, consultant, or any other role for which financial remuneration is requested.

3. Other Eligibility Criteria

DHS will not consider applications that do not adhere to one or more of the following requirements:

A. **Deadlines.** DHS will not accept late applications. Without exception, applications must be received by Grants.gov on or before the deadline in this announcement or they will not be considered.

B. **Application relevance.** Applications that do not address the purpose of this announcement will not be considered.

C. **Compliance and completeness.** Applications must substantially comply with the application submission instructions and requirements in this announcement or they will not be considered.

4. Maintenance of Effort (MOE)

Not Applicable.

5. **Cost Share or Match**
   Cost Share or Match is prohibited in this NOFO.

D. Application and Submission Information

1. **Key Dates and Times**
   a. **Application Start Date:** 06/08/2021

   b. **Letter of Intent Deadline:** 07/02/2021

   c. **Application Submission Deadline:** 07/26/2021 at 11:59:59PM [EDT]
   07/27/2021 at 3:59:59AM [GMT]

   Note: Late applications will not be reviewed.

   d. **Anticipated Funding Selection Date:** 08/31/2021

   e. **Anticipated Award Date:** 09/01/2021

   f. **Other Key Dates**

Event	Suggested Deadline for Completion
Obtaining DUNS Number	Four weeks before actual submission deadline
Obtaining a valid EIN	Four weeks before actual submission deadline
Updating SAM registration	Four weeks before actual submission deadline
Starting application in Grants.gov	One week before actual submission deadline

2. **Agreeing to Terms and Conditions of the Award**
   By submitting an application, applicants agree to comply with the requirements of this NOFO and the terms and conditions of the award, should they receive an award.

3. **Address to Request Application Package**
   Application forms and instructions are available at Grants.gov. To access these materials, go to http://www.grants.gov ; select "Applicants" then "Apply for Grants." In order to obtain the application package, select "Download a Grant Application Package." Enter the CFDA and/or the funding opportunity number located on the cover of this NOFO, select "Download Package," and then follow the prompts to download the application package.

   Application forms and instructions are available at Grants.gov. To access these materials, go to http://www.grants.gov.

   For a hardcopy of the full NOFO, please write or fax a request to:

Janet Bailey
Office of Procurement Operations (MGMT I OPO)
245 Murray Lane SW, Mail Stop 0115
Washington, D.C. 20528-0115
Office: (202) 447-0362
Email: janet.bailey@hq.dhs.gov

Applications will be processed through the Grants.gov portal. All applications are time stamped by the Grants.gov system when submitted and recipients are notified accordingly. The DHS Grants Office will download all applications that are received by the deadline date and time as indicated on the NOFO.

4. Steps Required to Submit an Application, Unique Entity Identifier, and System for Award Management (SAM)

To apply for an award under this program, all applicants must:

a. Apply for, update, or verify their Data Universal Numbering System (DUNS) Number from Dun & Bradstreet (D&B) and Employer ID Number (EIN)
b. In the application, provide a valid Data Universal Numbering System DUNS number, which is currently the unique entity identifier;
c. Have an account with login.gov;
d. Register for, update, or verify their SAM account and ensure the account is active before submitting the application;
e. Create a Grants.gov account;
f. Add a profile to a Grants.gov account;
g. Establish an Authorized Organizational Representative (AOR) in Grants.gov;
h. Submit application in Grants.gov; and
i. Continue to maintain an active SAM registration with current information, including information on a recipient's immediate and highest level owner and subsidiaries, as well on all predecessors that have been awarded a Federal contract or grant within the last 3 years, if applicable, at all times during which it has an active federal award or an application or plan under consideration by a federal awarding agency.

Applicants are advised that DHS may not make a federal award until the applicant has complied with all applicable DUNS and SAM requirements. Therefore, an applicant's SAM registration must be active not only at the time of application, but also during the application review period and when DHS is ready to make a federal award. Further, as noted above, an applicant's or recipient's SAM registration must remain active for the duration of an active federal award. If an applicant's SAM registration is expired at the time of application, expires during application review, or expires any other time before award, DHS may determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

The Standard Language for Using Grants.gov to Apply is provided to aid in fulfilling these requirements (if applicable), based on:

https://www.grants.gov/web/grants/grantors/grantor-standard-language.html:

5. Electronic Delivery

DHS is participating in the Grants.gov initiative to provide the grant community with a single site to find and apply for grant funding opportunities. DHS encourages or requires applicants to submit their applications online through Grants.gov, depending on the funding opportunity. For this funding opportunity, the CWMD Office requires applicants to submit applications through Grants.gov.

6. How to Register to Apply through Grants.gov

a. *Instructions:* Registering in Grants.gov is a multi-step process. Read the instructions below about registering to apply for DHS funds. Applicants should read the registration instructions carefully and prepare the information requested before beginning the registration process. Reviewing and assembling the required information before beginning the registration process will alleviate last-minute searches for required information.

The registration process can take up to four weeks to complete. Therefore, registration should be done in sufficient time to ensure it does not impact your ability to meet required application submission deadlines.

Organizations must have a Data Universal Numbering System (DUNS) Number, active System for Award Management (SAM) registration, and Grants.gov account to apply for grants. If individual applicants are eligible to apply for this grant funding opportunity, then you may begin with step 3, Create a Grants.gov account, listed below. Creating a Grants.gov account can be completed online in minutes, but DUNS and SAM registrations may take several weeks. Therefore, an organization's registration should be done in sufficient time to ensure it does not impact the entity's ability to meet required application submission deadlines. Complete organization instructions can be found on Grants.gov here:
https://www.grants.gov/web/grants/applicants/organization-registration.html

1) *Obtain a DUNS Number*: All entities applying for funding, including renewal funding, must have a DUNS number from Dun & Bradstreet (D&B). Applicants must enter the DUNS number in the data entry field labeled "Organizational DUNS" on the SF-424 form.

   For more detailed instructions for obtaining a DUNS number, refer to: https://www.grants.gov/web/grants/applicants/organization-registration/step-1-obtain-duns-number.html

2) *Register with SAM*: All organizations applying online through Grants.gov must register with the System for Award Management (SAM). Failure to register with SAM will prevent your organization from applying through Grants.gov. SAM registration must be renewed annually.

   For more detailed instructions for registering with SAM, refer to:
   https://www.grants.gov/web/grants/applicants/organization-registration/step-2-register-with-sam.html

3) *Create a Grants.gov Account*: The next step is to register an account with Grants.gov. Follow the on-screen instructions or refer to the detailed instructions here: https://www.grants.gov/web/grants/applicants/registration.html

4) *Add a Profile to a Grants.gov Account*: A profile in Grants.gov corresponds to a single applicant organization the user represents (i.e., an applicant) or an individual applicant. If you work for or consult with multiple organizations and have a profile for each, you may log in to one Grants.gov account to access all of your grant applications. To add an organizational profile to your Grants.gov account, enter the DUNS Number for the organization in the DUNS field while adding a profile.

   For more detailed instructions about creating a profile on Grants.gov, refer to: https://www.grants.gov/web/grants/applicants/registration/add-profile.html

5) *EBiz POC Authorized Profile Roles*: After you register with Grants.gov and create an Organization Applicant Profile, the organization applicant's request for Grants.gov roles and access is sent to the EBiz POC. The EBiz POC will then log in to Grants.gov and authorize the appropriate roles, which may include the AOR role, thereby giving you permission to complete and submit applications on behalf of the organization. You will be able to submit your application online any time after you have been assigned the AOR role.

   For more detailed instructions about creating a profile on Grants.gov, refer to: https://www.grants.gov/web/grants/applicants/registration/authorize-roles.html

6) *Track Role Status*: To track your role request, refer to: https://www.grants.gov/web/grants/applicants/registration/track-role-status.html

7) *Electronic Signature*: When applications are submitted through Grants.gov, the name of the organization applicant with the AOR role that submitted the application is inserted into the signature line of the application, serving as the electronic signature. The EBiz POC **must** authorize people who are able to make legally binding commitments on behalf of the organization as a user with the AOR role; **this step is often missed, and it is crucial for valid and timely submissions.**

7. How to Submit an Application to DHS via Grants.gov

Grants.gov applicants can apply online using Workspace. Workspace is a shared, online environment where members of a grant team may simultaneously access and edit different webforms within an application. For each NOFO, you can create individual instances of a workspace.

Below is an overview of the process to apply on Grants.gov. For access to complete instructions on how to apply for opportunities using Workspace, refer to: https://www.grants.gov/web/grants/applicants/workspace-overview.html

a. *Create a Workspace*: Creating a workspace allows you to complete it online and route it through your organization for review before submitting.

b. *Complete a Workspace*: Add participants to the workspace to work on the application together, complete all the required forms online or by downloading PDF versions, and check for errors before submission. The Workspace progress bar will display the state of your application process as you apply. As you apply using Workspace, you may click the blue question mark icon near the upper-right corner of each page to access context-sensitive help.

c. *Adobe Reader*: If you decide not to apply by filling out webforms you can download individual PDF forms in Workspace. The individual PDF forms can be downloaded and saved to your local device storage, network drive(s), or external drives, then accessed through Adobe Reader.

   NOTE: Visit the Adobe Software Compatibility page on Grants.gov to download the appropriate version of the software at:
   https://www.grants.gov/web/grants/applicants/adobe-software-compatibility.html

d. *Mandatory Fields in Forms:* In the forms, you will note fields marked with an asterisk and a different background color. These fields are mandatory fields that must be completed to successfully submit your application.

e. *Complete SF-424 Fields First*: The forms are designed to fill in common required fields across other forms, such as the applicant name, address, and DUNS number. To trigger this feature, an applicant must complete the SF-424 information first. Once it is completed, the information will transfer to the other forms.

f. *Submit a Workspace*: An application may be submitted through workspace by clicking the Sign and Submit button on the Manage Workspace page, under the Forms tab. Grants.gov recommends submitting your application package at least 24-48 hours prior to the close date to provide you with time to correct any potential technical issues that may disrupt the application submission.

g. *Track a Workspace Submission*: After successfully submitting a workspace application, a Grants.gov Tracking Number (GRANTXXXXXXXX) is automatically assigned to the application. The number will be listed on the Confirmation page that is generated after submission. Using the tracking number, access the Track My Application page under the Applicants tab or the Details tab in the submitted workspace.

For additional training resources, including video tutorials, refer to:
https://www.grants.gov/web/grants/applicants/applicant-training.html

Applicant Support: Grants.gov provides applicants 24/7 support via the toll-free number 1-800-518-4726 and email at support@grants.gov. For questions related to the specific grant

opportunity, contact the number listed in the application package of the grant you are applying for.

If you are experiencing difficulties with your submission, it is best to call the Grants.gov Support Center and get a ticket number. The Support Center ticket number will assist DHS with tracking your issue and understanding background information on the issue.

8. **Submitting the Final Application in another grant system:**
   Not Applicable.

9. **Timely Receipt Requirements and Proof of Timely Submission**
   Online Submission: All applications must be received by 11:59:59 PM Eastern time on the due date established for each program. Proof of timely submission is automatically recorded by Grants.gov. An electronic date/time stamp is generated within the system when the application is successfully received by Grants.gov. The applicant with the AOR role who submitted the application will receive an acknowledgement of receipt and a tracking number (GRANTXXXXXXXX) from Grants.gov with the successful transmission of their application. This applicant with the AOR role will also receive the official date/time stamp and Grants.gov Tracking number in an email serving as proof of their timely submission.

   When DHS successfully retrieves the application from Grants.gov, and acknowledges the download of submissions, Grants.gov will provide an electronic acknowledgment of receipt of the application to the email address of the applicant with the AOR role who submitted the application. Again, proof of timely submission shall be the official date and time that Grants.gov receives your application. Applications received by Grants.gov after the established due date for the program will be considered late and will not be considered for funding by DHS.

   Applicants using slow internet, such as dial-up connections, should be aware that transmission can take some time before Grants.gov receives your application. Again, Grants.gov will provide either an error or a successfully received transmission in the form of an email sent to the applicant with the AOR role attempting to submit the application. The Grants.gov Support Center reports that some applicants end the transmission because they think that nothing is occurring during the transmission process. Please be patient and give the system time to process the application.

10. **Content and Form of Application Submission**

- **SF424 (R&R) Application for Federal Assistance (SF424-V2.0)**
  Please complete this form in its entirety. If you fill this form out first, other required forms will populate with basic data such as name, address, etc. Signature and date will auto-fill when you submit the application package through Grants.gov.
  a. Block 1, Type of Submission – Please check "Application."
  b. Block 8, Type of Application – Please check "New."
  c. Block 12, Proposed Project – Enter Dates of Entire Project Period

d. Block 15a, Estimated Project Funding – This amount should correspond to your R&R Budget form's total and budget justification total for the requested budget period.
e. Block 16, E.O. 12372 review question – Please check "No."
f. Block 17 - By submitting this application, your organization is providing certifications and assurances regarding:
   i. Drug-Free Workplace Requirements
   ii. Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions
   iii. Assurance that your organization is not delinquent on any Federal debt.

- **Research & Related (R&R) Budget**

  An R&R Budget is required for ALL applications. Please ensure that the total amount requested corresponds to Block 15.a on the SF 424 R&R form. Include up to three to five annual budgets, one for each year of the duration of the award; a cumulative budget will be automatically generated by Grants.gov. A detailed budget justification (up to three pages) should document proposed expenses. Multi- institutional proposals should use the award-sub award proposal mechanisms.

  Mention if any government-furnished equipment (GFE, e.g. specific radioactive sources to calibrate or test detector systems) is required. Attach an expanded equipment list (see item C on R&R Budget Form) if necessary.

  An annual grantees review will enable the investigators of grants awarded through this solicitation to review progress, exchange information, and promote collaborations. The PI, all co-PIs, and at least one of the students supported from each funded grant will be required to participate. Representatives of CWMD, DHS Science and Technology, other Federal agencies, and various National Laboratories and industry are also expected to be present at this annual review to provide an expanded opportunity for collaboration and information sharing. Funds must be included in each year of the proposal budget for attendance at this annual workshop, should public health conditions allow for an in-person workshop. For budgetary purposes, the workshop may be assumed to be in the U.S. and be of three days duration. This workshop will be a primary mechanism for the CWMD program managers to assess progress and thus to adjust the future funding profiles for individual projects.

- **Budget Justification**

  A Budget Justification is required for ALL applications. Please ensure that items listed in the budget justification correspond to the funds requested in Volume III, Cost Proposal. Please use the following cost categories to group items of cost in your budget justification.

PERSONNEL
FRINGE BENEFITS
TRAVEL
EQUIPMENT
SUPPLIES
CONTRACTUAL
OTHER DIRECT COSTS
INDIRECT COSTS

If you wish to display your budget justification by task, please ensure that you supply a total for each of the cost categories listed above for the proposed budget period in your application.

Research & Related Project/Performance Site Location(s)
Please provide information for every site (including subcontractors and outside vendors, with sub-awards or subcontracts of $25,000 or more) in your project.

Research & Related Senior/Key Personnel Profile
Please supply biographical information on key personnel.

Research & Related Other Project Information
Please define any technical terminology that is discipline-specific. Be concise and direct in descriptions. Tip: Write for a general audience.

Government Furnished Equipment
Mention if any government-furnished equipment (GFE, e.g. specific radioactive sources to calibrate or test detector systems) is required.

Letter of Intent

A letter of intent (LOI) is an optional, non-binding statement of an eligible offeror's interest in applying for funding under this NOFO. While this information is requested, it is not considered a part of the application nor used in any way to judge an application. CWMD will use the LOIs solely for internal planning purposes.

The LOI template will be provided as an attachment to this NOFO on grants.gov. The template will collect the following information:

- Name of applicant organization
- Topic Area (topic number and title, see Appendix A) against which the Principal Investigator intends to submit an application
- Principal Investigator's name, mailing address, telephone number, and email address
- Business Official's name, mailing address, telephone number, and email address

The LOI must be emailed no later than **July 2, 2021** to:

CWMD ARI Inbox
Email: cwmd.tsi@hq.dhs.gov

Proposal Preparation Instructions:

A. Cover Sheet:

The cover sheet information is shown below. Note: for a proposal ID, please follow the following naming convention:

ARINOFO21-XXXX-YYYY-TA-0#-0##
XXXX = four letter (maximum 4 letter) character shortcut for organization name
YYYY = four letter (maximum 4 letter) character shortcut for department/division name
# = Topic Area number
= number of proposal submission.

Example: Organization A, Dept. B's submission for its first proposal to topic 01 would have the ID listed: ARINOFO21-ORGA-DEPB-TA-01-001

The cover sheet should describe:

- Overall project information (Requested budget for this period, project duration, project title)
- Primary Organization Information (Name and address, DUNS+4, TIN/EIN)
- Principal Investigator information (Name and address, phone, email, Co-PI information if applicable)
- Contact information for any organization involved in a collaborative effort, if applicable.

For a fillable .pdf copy of the cover sheet, please send a request to cwmd.tsi@hq.dhs.gov

B. Quad Chart:

The quad chart provides a single page summary of the effort and should include a picture, graphic or artist's conception of the effort in the top left, a summary of intellectual merit in the bottom left, a summary of broader impact on the top right, and a summary of schedule and proposed budget in the bottom right.

For a quad chart template, please send a request to cwmd.tsi@hq.dhs.gov

C. Proposed Research: Narrative consisting of the following items:

- An explanation of the scientific context, intellectual merit, relevance to the Topic Solicitation, its potential long-term impact and timeliness of the proposed project;

- A detailed description of the proposed research, its goals, objectives and milestones, how it compares to the current state-of-the-art, and any substantive risks and risk mitigation strategies;
- A brief summary of prior research in this area and how the proposed research differs from this prior research;
- A discussion of the broader impacts of the proposed work;
- If appropriate, a justification for why an effort involving at least two investigators is necessary to carry out the proposed project;
- If appropriate, a discussion of the multidisciplinary approach taken and its proposed benefits;
- A description of the contribution to be made by each senior investigator; and
- A timeline for the planned work.

D. Modes of Dissemination and Education: Narrative describing:

- The mode of training undergraduate students, graduate students, and postdoctoral researchers, including co-mentorship or other collaborative training; and
- Plans for dissemination and education/outreach/publications including any pilot activities. Where possible, results from the research should be made publicly available to enable dissemination of results to broadly enhance scientific and technological understanding that may be beneficial to the homeland security enterprise and operators, academic community, and society such as through publications, conference presentations, and intellectual property resulting from the project.

E. Management Plan: If appropriate, narrative describing:

- How the group effort will be coordinated, including the role of industry and/or national laboratory partners;
- How decisions will be made regarding the conduct of the project; and
- How collaboration will be evaluated.

F. References Cited:

References should include full titles of articles and book chapters cited. This section should include bibliographic citations only and must not be used to provide parenthetical information outside of the project description. Indicate with an asterisk (*) references co-authored by two or more proposal investigators.

G. Formatting: The format applies to items 2-7 above:

- Proposal submission shall not exceed sixteen (16) pages of standard size (8.5" by 11") using 1" margins. Proposals for which Volume I exceeds the 16 page limit will have any pages above the 16 page limit removed and those pages will not be reviewed or evaluated.
- 12 point fonts or larger for text
- 9 point fonts or larger for pictures, figures, tables and charts

11. Other Submission Requirements

All files submitted in the application shall be in .pdf format. Limit filenames to 50 characters. Do not password-protect files.

12. Intergovernmental Review

An intergovernmental review may be required. Applicants must contact their state's Single Point of Contact (SPOC) to comply with the state's process under Executive Order 12372.

(See https://www.archives.gov/federal-register/codification/executive-order/12372.html; https://www.whitehouse.gov/wp-content/uploads/2019/02/SPOC-February-2019.pdf).

13. Funding Restrictions

Award Size: DHS intends to make 8-11 awards in FY 2021.
For the purposes of this announcement, applicants should account for time to ramp up research including finding students to work on the project. Budgets for the first year will likely be lower than for future years when the team is fully formed and the project is at a more mature stage of development.

Students: Students supported (funded) under this project are classified as trainees and must be citizens or permanent residents of the U.S., its territories or its possessions. Students who are not citizens or permanent residents of the U.S., its territories, or its possessions may be involved in the project, but not funded.

Kick-Off Review: This meeting will be held remotely or on-site to discuss in detail the technical and programmatic aspects of the proposed research.

Project Reviews and Updates: The ARI Program requires 3 meetings each year, which can take place at the awardee site, CWMD office, virtually, and/or partner site. These meetings will go over project progress to date and allow for in depth discussions of the project, as well as opportunities for students to participate. Each month there will also be a teleconference to go over project updates.

Publications and Press Releases: All public-facing materials which discuss work completed under the ARI Program including, but not limited to, publications, abstracts, presentations, media releases, and interviews, must be approved for public release by the Program Office. The Program Office requires at least 10 business days to review any material in advance of submission.

Foreign Travel: Foreign travel required in the performance of the duties approved in this Award must be approved by DHS in advance and in writing and comply with the applicable OMB Cost Principles Circular. Requests for foreign travel identifying the traveler, the purpose, the destination, and the estimated travel costs must be submitted to the DHS Grants Officer 60 days prior to the commencement of travel.

14. Allowable Costs

a. Pre-Award Costs
Not Applicable.

b. Management and Administration (M&A) Costs
M&A are not operational costs but are necessary costs incurred in direct support of the grant or cooperative agreement or as a consequence of it, such as travel, meeting-related expenses, and salaries of full/part-time staff in direct support of the program. As such these can be itemized in financial reports.

c. Indirect Facilities & Administrative (F&A) Costs *(if applicable)*
Indirect Cost (IDC) is allowable by the recipient and sub-recipients. IDC is based on a federally approved and negotiated rate. Please provide a copy of the negotiated rate approved by the applicant's cognizant agency at the time of application. Indirect costs on sub-awards are limited to the first $25,000 of direct costs.

E. Application Review Information

1. Application Evaluation Criteria

a. Programmatic Criteria

The evaluation of proposals submitted in response to this NOFO will be accomplished through an independent technical review using the following criteria, which are of equal importance:

Criterion I: Intellectual Merit and Technical Approach
The following elements will be considered upon technical evaluation:

- The intellectual merit of the proposed research activity will serve to advance knowledge and understanding within the related technical field and/or across multiple related disciplines.
- The proposed team (including industry or laboratory partner, if any) has the experience (include prior, if available) and expertise to conduct the proposed research.
- The proposed technical plan is clear and complete and addresses cost/schedule, technical strategies, and resources.
- The appropriateness and reasonableness of the proposed costs.

Criterion II: Transformational Impact
The following elements will be considered upon technical evaluation, as applicable:

- The relevance of the application toward the Topic Area requirements/objectives and the CWMD mission.
- The success of the proposed research will address operator needs in the CWMD mission space.

- The proposed research activity exhibits creative, original (non-duplicative), innovative, and/or transformative concepts.

Criterion III: Broader Impact

The following elements will be considered upon technical evaluation:

- The research activity will advance knowledge and understanding in CWMD-related solutions while promoting teaching, training, and learning to support fostering the next generation scientists and engineers.
- The degree of undergraduate and/or graduate student participation in the proposed research.
- The proposed activity will broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic).
- The dissemination of the results will broadly enhance scientific and technological understanding that may be beneficial to the academic community and society.

b. Financial Integrity Criteria

Prior to making a federal award, the <*DHS FAO*> is required by 31 U.S.C. § 3321 note, 41 U.S.C. § 2313, and 2 C.F.R.§ 200.205 to review information available through any OMB-designated repositories of government wide eligibility qualification or financial integrity information. Therefore, application evaluation criteria may include the following risk-based considerations of the applicant:

1) Financial stability.
2) Quality of management systems and ability to meet management standards.
3) History of performance in managing federal award.
4) Reports and findings from audits.
5) Ability to effectively implement statutory, regulatory, or other requirements.

c. Supplemental Financial Integrity Criteria and Review

Prior to making a federal award where the anticipated total federal share will be greater than the simplified acquisition threshold, currently $250,000 (see Section 805 of the National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, OMB Memorandum M-18-18 at: https://www.whitehouse.gov/wp-content/uploads/2018/06/M-18-18.pdf):

1) CWMD is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM, which is currently the Federal Awardee Performance and Integrity Information System (FAPIIS) and is accessible through the beta.sam website.
2) An applicant, at its option, may review information in FAPIIS and comment on any information about itself that a federal awarding agency previously entered.
3) CWMD will consider any comments by the applicant, in addition to the other information in FAPIIS, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards

when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.206.

2. **Review and Selection Process**

Application Receipt. All completed applications ("proposals") submitted through Grants.gov in response to this NOFO will be subjected to a technical evaluation by a panel review. This NOFO contains three topic areas. Proposals that are determined non-compliant to the topic area(s) will not be considered for technical evaluation.

Application Handling. Completed applications will be handled following DHS safeguarding procedures. All application materials will be treated as confidential.

Panel Review and Reviewers. Each application will be reviewed by at least three (3) panelists. Panelists are subject-matter experts (SMEs) assigned to the appropriate topics (areas) based on their technical expertise. The panelists and review will be established and conducted by the Program office.

Selection Process

Evaluation: Reviewers will conduct their individual evaluation for each assigned application. Following the individual evaluation, a consensus review will be held to formulate a recommendation for each application. The rating of recommendations for each application will follow:

Recommended (R) – Proposals have met and/or exceed the topic requirements/objectives and will conduct successful research. Proposals under this rating are recommended for funding.

Selectable (S) – Proposals will likely satisfy the topic requirements/objectives and has a likelihood of successful research. Proposals under this rating are recommended for funding, if available.

Not Recommended (NR) – Proposals that are non-responsive to the topic area requirements/objectives and/or do not satisfy the evaluation criteria and will unlikely conduct a successful research. Proposals under this rating are not recommended for funding.

A summary of the recommendation and accompanying narrative will be completed by each reviewer. The Program Office will make the selection based on the consensus evaluation. Please note that decisions to fund all the recommended for funding proposals are subjected to available funding.

When the anticipated Federal award amount will be greater than the simplified acquisition threshold, currently $250,000 (see 2 CFR §200.88), the following applies:

i. Prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, DHS is required to review and consider any

information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS).

ii. An applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

iii. DHS will consider any comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 CFR §200.205 Federal awarding agency review of risk posed by applicants.

F. Federal Award Administration Information

1. Notice of Award

Notification of the award is made to the submitting organization via email by a Grants Officer in the Grants and Financial Assistance Division. Notification may be made prior to the award being completed. The notification of award is not an authorization to begin performance. Award documentation, signed by the grants officer, is the authorizing document. The award documentation will also have period of performance dates.

Before accepting the award, the AOR and recipient should carefully read the award package. The award package includes instructions on administering the grant award and the terms and conditions associated with responsibilities under federal awards. **Recipients must accept all conditions in this NOFO as well as any special terms and conditions in the Notice of Award to receive an award under this program.**

Notice of Not Selection for Award

Applications that were not selected for award will be notified by a Grants Officer via e-mail in the Grants and Financial Assistance Division in a timely manner. The Applicant will receive feedback comments from the consensus reviews. The feedback comments will not include the identities of the panelists and reviewers.

2. Pass-Through Requirements

Not Applicable.

3. Administrative and National Policy Requirements

All successful applicants for DHS grant and cooperative agreements are required to comply with DHS Standard Terms and Conditions, which are available online at: DHS Standard Terms and Conditions.

The applicable DHS Standard Terms and Conditions will be those in effect at the time the award was made, unless the application is for a continuation award. In that event, the terms and conditions in effect at the time the original award was made will generally apply. What

terms and conditions will apply for the award will be clearly stated in the award package at the time of award.

4. **Reporting**

a. Federal Financial Reporting Requirements

The Federal Financial Report (FFR) form is available online at: SF-425 *OMB #4040-0014*

i. Quarterly Federal Financial Reports (Cash Transaction) – The Recipient shall submit the FFR (SF 425) Federal Cash Transaction Report to the Department of Health and Human Services, Payment Management System, Smartlink. Quarterly Cash Transaction reports shall be submitted no later than 1/30, 4/30, 7/30 and 10/30.

ii. Annual Federal Financial Report – The Recipient shall submit an annual Federal Financial Report (SF 425) to the DHS Grants Officer no later than 90 days after the Budget Period end date. The report must be submitted via email to DHS-GrantReports@dhs.gov and cwmd.tsi@hq.dhs.gov. Be sure to include the grant program name and number in the subject line.

iii. Final Federal Financial Report – the Recipient shall submit the final Federal Financial Report (SF425) to the DHS Grants Officer no later than 90 days after the end of the Project Period end date. The report must be submitted via email to DHS-GrantReports@dhs.gov and dndoari.del@hq.dhs.gov. Be sure to include the grant program name and number in the subject line.

b. Programmatic Performance Reporting Requirements

Deliverables will include the following:

A. Monthly Project Reporting: A monthly report will be submitted each month to provide project updates. The due date is no later than the 15th of the month following the month being reported. For example, a monthly report for June will be due no later than July 15th. A monthly report template will be provided by the program office.

B. Annual Project Report and Accomplishments: A detailed annual report shall be submitted no later than 30 days after the budget period end date. The report shall include an updated project quad chart and summary of fiscal year accomplishments.

C. Final (End of Program) Performance Report Final Federal Financial Report – The Recipient shall submit the final Federal Financial Report (SF425) to the DHS Grants Officer no later than 120 days after the end of the Project Period end date. The report must be submitted via email to DHS-GrantReports@dhs.gov and cwmd.tsi@hq.dhs.gov. Be sure to include the grant program name and number in the subject line.

c. Additional Performance Reporting Requirements

The Program Office will have substantial involvement in the administration of the award(s) including tracking research progress toward defined objectives and goals, funding levels and expenditures, and tracking of project publications, patents, and student participants. The recipient will be required to maintain close and regular interaction with the Program Office, including: a) kick-off reviews to discuss in detail the technical and programmatic aspects of the proposed research; and b) program review meetings 3 times per year at recipient site, CWMD office, and/or remotely.

d. Closeout Reporting Requirements

Within 120 days after the end of the period of performance, or after an amendment has been issued to close out a grant, recipients must submit the following:

1) The final request for payment, if applicable;
2) The final FFR (SF-425);
3) The final progress report detailing all accomplishments;
4) A qualitative narrative summary of the impact of those accomplishments throughout the period of performance; and
5) Other documents required by this NOFO, terms and conditions of the award, or other CWMD guidance.

If applicable, an inventory of all construction projects that used funds from this program must be reported with the final progress report.

After these reports have been reviewed and approved by CWMD, a closeout notice will be completed to close out the grant. The notice will indicate the period of performance as closed, list any remaining funds that will be deobligated, and address the requirement of maintaining the grant records for three years from the date of the final FFR, unless a longer period applies, such as due to an audit or litigation, for equipment or real property used beyond the period of performance, or due to other circumstances outlined in 2 C.F.R. § 200.334.

In addition, any recipient that issues subawards to any subrecipient is responsible for closing out those subawards as described in 2 C.F.R. § 200.344. Recipients acting as pass-through entities must ensure that they complete the closeout of their subawards in time to submit all necessary documentation and information to CWMD during the closeout of their prime grant award.

The recipient is responsible for returning any funds that have been drawn down but remain as unliquidated on recipient financial records.

e. Disclosing Information per 2 C.F.R. § 180.335

This reporting requirement pertains to disclosing information related to government-wide suspension and debarment requirements. Before a recipient enters into a grant award with CWMD, the recipient must notify CWMD if it knows if it or any of the recipient's principals under the award fall under one or more of the four criteria listed at 2 C.F.R. § 180.335:

1) Are presently excluded or disqualified;

2) Have been convicted within the preceding three years of any of the offenses listed in 2 C.F.R. § 180.800(a) or had a civil judgment rendered against it or any of the recipient's principals for one of those offenses within that time period;
3) Are presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state or local) with commission of any of the offenses listed in 2 C.F.R. § 180.800(a); or
4) Have had one or more public transactions (federal, state, or local) terminated within the preceding three years for cause or default.

At any time after accepting the award, if the recipient learns that it or any of its principals falls under one or more of the criteria listed at 2 C.F.R. § 180.335, the recipient must provide immediate written notice to CWMD in accordance with 2 C.F.R. § 180.350.

f. Reporting of Matters Related to Recipient Integrity and Performance

Per 2 C.F.R. Part 200, Appendix I § F.3, the additional post-award reporting requirements in 2 C.F.R. Part 200, Appendix XII may apply to applicants who, if upon becoming recipients, have a total value of currently active grants, cooperative agreements, and procurement contracts from all federal awarding agencies that exceeds $10,000,000 for any period of time during the period of performance of an award under this funding opportunity. Recipients that meet these criteria must maintain current information reported in FAPIIS about civil, criminal, or administrative proceedings described in paragraph 2 of Appendix XII at the reporting frequency described in paragraph 4 of Appendix XII.

5. Monitoring and Oversight

Per 2 C.F.R. § 200.329, CWMD, through its authorized representatives, has the right, at all reasonable times, to conduct desk reviews, make site visits to review project accomplishments and management control systems to review project accomplishments and to provide any required technical assistance. During site visits, CWMD will review grant recipients' files related to the grant award. As part of any monitoring and program evaluation activities, grant recipients must permit CWMD, upon reasonable notice, to review grant-related records and to interview the organization's staff and contractors regarding the program. Recipients must respond in a timely and accurate manner to CWMD requests for information relating to the grant program**.**

G. DHS Awarding Agency Contact Information

a. Contact and Resource Information

The **Program Officer** shall be the DHS official responsible for monitoring the completion of work and technical performance of the projects or activities described in the Program Narrative Statement:

Anthony Esposito

DHS Countering Weapons of Mass Destruction Office
CWMD Stop 0315
245 Murray Lane SW
Washington, DC 20528-0550
Office: (202) 934-1763
Email: anthony.esposito@hq.dhs.gov
Program inbox: cwmd.tsi@hq.dhs.gov

The **Grants Officer** shall be the DHS official that has the full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program Officer.

Janet Bailey
Office of Procurement Operations (MGMT I OPO)
245 Murray Lane SW, Mail Stop 0115
Washington, D.C. 20528-0115
Office: (202) 447-0362
Email: janet.bailey**@hq.dhs.gov**

H. Additional Information

a. Period of Performance Extensions

Extensions to the period of performance under this program are allowed. Note: Extensions are only allowed during the last year of the award. Please follow the instructions below to apply for an extension.

- Send a request for the form to the Program Office, the Grants Officer and the program inbox – cwmd.tsi@hq.dhs.gov. Upon completion of the Extension Request form, send your completed forms to the Program Office, Grants Officer and the program inbox.
- Requests shall be submitted no later than one month prior to the end of period of performance.

b. Carry-forward/Carry-over

Budget periods are funded annually. Any unobligated funds remaining at the end of an initial budget period will automatically transfer to the next budget period, a process commonly known as carry-forward or carry-over, subsequent budget period amounts may be reduced in proportion to the carry-forward/carryover amounts. DHS may request estimated Federal Financial Reports (FFRs) be submitted prior to the budget period end date to determine potential unobligated amounts. **Large unobligated amounts may result in reduction in new funds for future budget years.**

c. Risk Assessment Evaluation

DHS staff will evaluate the risks to the program posed by each applicant, including conducting due diligence to ensure an applicant's ability to manage federal funds. This evaluation is in addition to the evaluation of the applicant's eligibility and the quality of its application on the basis of the Selection Criteria, and results from this evaluation may assist

funding decisions. If an award is made, DHS may apply special conditions that correspond to the degree of risk of the award.

In evaluating risks, DHS may consider the following:

- Financial stability;
- Quality of management systems and ability to meet the management standards prescribed in applicable OMB Guidance;
- Applicant's record in managing previous DHS awards, cooperative agreements, or procurement awards, including:

    1. Timeliness of compliance with applicable reporting requirements
    2. Accuracy of data reported
    3. Conformance to the terms and conditions of previous federal awards
    4. If applicable, the extent to which any previously awarded amounts will be expended prior to future awards
    5. Information available through OMB-designated repositories of government-wide eligibility qualification or financial integrity information, such as: Federal Awardee Performance and Integrity Information System (FAPIIS), Duns and SAM
    6. Reports and findings from single audits performed under Subpart F – Audit Requirements, 2 C.F.R. Part 200 and findings and reports of any other available audits
    7. Applicant organization's annual report
    8. Publicly available information, including information from the applicant organization's website
    9. Applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on award recipients.

In addition, organizations who have not received prior DHS Grants and Financial Assistance Division (GFAD) awards may be required to complete a risk assessment questionnaire as part of the pre-award financial and administrative review.

Applicant Disclosure of High Risk Status

Applicants are to disclose if they are currently designated as high risk by a federal awarding agency. This includes, but is not limited to, any status requiring additional oversight by a federal awarding agency due to past programmatic, administrative or financial concerns. If an applicant is designated as high risk by a federal awarding agency, it should provide an explanation with the application package and include the following information:

- The federal awarding agency that assigned the high risk status;
- The federal awarding agency's point of contact for the risk status, including name, phone number and email address;
- Date of the risk status designation;
- Reason(s) for the risk status.

DHS seeks this information to ensure appropriate federal oversight of all grant awards. The disclosure of an organization's risk status does not disqualify it from receiving an award; however additional grant oversight may be required. If necessary, this information will be provided in the award documentation. Failure to disclose high risk status may result in award termination or other remedies.

Obligation by DHS/GFAD

Publication of this Notice of Funding Opportunity (NOFO) does not obligate the Department of Homeland Security (DHS), Grants and Financial Assistance Division (GFAD) to award any specific number of grants and/or cooperative agreements or to obligate any particular amount of funding.

Appendix A: Topic Solicitations

Topic Area 1 (TA-01)
Topic Title: MicroRNA as Biomarkers for Early Biothreat Detection

Objective: Investigate the potential application of microRNAs for detection and identification of biothreat agents in accordance with DHS CWMD mission space.

Technology Readiness Level at Beginning: TRL 1-2
Technology Readiness Level at Conclusion: TRL 3-4
(Note: TRL definitions can be found in Chart at the end of Appendix A.)

Background
MicroRNAs (miRNAs) are small, noncoding RNAs that have emerged in a rapidly expanding area of interest involving diagnostic and prognostic research (Hammond 2015; Tribolet 2020). miRNAs are expressed in plant, animal, and human tissues, and may be found in noninvasive human samples (e.g., saliva, blood, urine, sweat, and other biofluids). Post-transcriptionally, they regulate the expression of genes and have been found to modulate many cellular processes. Evidence suggests alterations in miRNA profiles and expression levels may appear before any disease symptoms. miRNA may potentially serve as early epigenetic biomarkers for critical diseases or exposure to highly contagious and transmissible bioagents (Tribolet 2020).

Current biodetection technologies generally involve laborious, costly, and/or time-consuming processes. These typically include culturing of potential bioagents, ELISAs, microscopy, mass spectrometry, or nucleic acid-based methods. These diagnostic assays may also yield false negatives due to low specificity, limitations in the limits of detection and/or delayed antibody response following exposure to a biological agent of concern. Therefore, DHS continually seeks to explore alternative and innovative areas of research to identify and develop technologies that can provide highly specific diagnostic tools capable of performing in a rapid and laboratory-independent manner.

The exploration of miRNAs as a new diagnostic biomarker has shown promise as a possible solution to these issues. Recent studies have demonstrated changes in circulating miRNAs following exposure to various microbial pathogens including some of national security concern (see Tribolet 2020 for review). Given the presence and stability in a wide range of biological fluids and tissues, changes in circulating miRNAs may prove useful in differential diagnostics, determination of disease state, and/or response to treatment for bioagents of concern.

Successful implementation of this concept requires fundamental research into structural dynamics and functionalities of miRNAs. This should include (but is not limited to) both *in vivo* and *in vitro* research exploring miRNA expression pattern recognition related to different pathogens or types of pathogens, with focus on pathogens of security concern (US Select Agents and Toxins, emerging and re-emerging pathogens of pandemic potential, and pathogens of economic/national security importance including those of both human health and the Food, Agriculture, and Veterinary sector). The goal of this effort is to further the understanding of miRNA expression

related to infectious disease-causing biological agents of security concern. The integration of miRNA detection assays in surveillance devices represents an intriguing approach for development of target-specific and rapid detection technologies for sensing applications. Ultimately, these tools would be used by DHS Components in the field to screen for the presence of biothreats or screen potentially infected individuals and/or animals to aid early detection and biosurveillance in order to prevent disease outbreaks and enhance national security.

Description

- The solicitation seeks to fund a theoretical and experimental effort to improve the understanding of microRNA (miRNA) as a tool in early detection of biothreat agents of concern (see below).
- Efforts may include, but are not limited to, both *in vivo* and *in vitro* research to understand how changes in miRNA packaging and/or expression levels can affect miRNA functionality as well as whether individuals or animals exposed to bioagents have different expression profiles of circulating serum miRNA compared with controls.
- These efforts should lead ultimately towards development of early prediction, detection, diagnosis, and/or monitoring methods, of biothreats related to the DHS CWMD mission space.
- Biothreat agents of concern in the CWMD mission space include pathogens listed in the US Select Agent and Toxin list, emerging and re-emerging pathogens of pandemic potential, and pathogens of economic/national security importance including those of both human health and the Food, Agriculture, and Veterinary sector. This effort is not focused on pathogens causing short-term or self-limiting infections; rather it is focused on differential diagnostics of pathogen exposure. Near neighbors, and/or non-pathogenic simulants of high-consequence pathogens are expected to be used for early proof-of-concept studies where possible.

Award Amounts for Topic Area 1 (TA-01) are anticipated to be up to $650,000 per year, for up to five years. In all cases, the proposed award value should be clearly substantiated by the scope of the effort.

References:

1. S. Hammond, An overview of microRNAs. *Adv. Drug. Deliv. Rev*. 87:3–14 (2015).
2. L. Tribolet, E.Kerr, C. Cowled, MicroRNA biomarkers for infectious diseases: from basic research to biosensing. *Front. Microbiol.* 11:1197 (2020).

Topic Area 2 (TA-02)

Topic Solicitation Title: Chemical, Biological, or Radiological/Nuclear (CBRN) Area Detection and Analytics

Objective: Develop a broad-area sensing array approach for CBRN threat detection and tracking before, during, and after a high-profile event.

Technology Readiness Level at Beginning: TRL 3
Technology Readiness Level at Conclusion: TRL 5

(Note: TRL definitions can be found in Chart at the end of Appendix A.)

Background

With the Countering Weapons of Mass Destruction Act of 2018, development and implementation of the Global Nuclear Detection Architecture (GNDA) was construed to also cover the chemical and biological responsibilities of the Assistant Secretary for the CWMD Office. To fulfill those responsibilities, CWMD seeks to further develop capabilities for detecting the full range of threats and for enabling optimal deployment paradigms. Major metropolitan areas have a variety of benign materials that can confound chemical, biological, radiological, and nuclear (CBRN) detection systems. The interiors of multi-story buildings, particularly those hosting research and development activities, can present similar challenges. Measuring and accounting for the baseline and variability of those materials is essential to the operation of any deployed systems. Applying analytical tools to track movement of materials through a network of sensors will provide real-time awareness before, during, and after a high-profile event. Ensuring that a system dependent on analytical tools applied to a range of sensor inputs is resilient against cyber or spoofing attacks will be crucial for operator confidence.

Description

- The goal of this topic is to develop capabilities that provide ideal coverage of a major metropolitan area to detect, track, and trace any CBRN threats that enter, exit, or transit the city, providing important information for law enforcement and for public safety decisions.
- An alternative goal is to develop capabilities that provide ideal coverage for CBRN threats to or within a building.
- In both indoor and outdoor approaches, translating the outputs of sensor systems into actionable information for officials is essential.
- Understanding the cyclic and stochastic fluctuations of confounding materials would generate a baseline and would help ultimately in the discrimination between benign and threat materials and behaviors.
- University campuses and their variety of buildings are promising venues for the collection and analysis of background and source information, resulting in the construction of algorithms to yield actionable information.

The expected scope of research proposals sought by this topic is as follows:

- Choice of threat modality: chemical, biological, or radiological/nuclear
- Choice of indoor or outdoor measurements
- Baseline measurements with multiple sensors, to understand environmental backgrounds and patterns-of-life variability, with contextual sensors (e.g., video, weather) as needed
- Analytics on multiple sensors to demonstrate localization of CBRN sources
- Hardening of analytic system to protect against spoofing, compromise, or bias

The results of the work will be presented to DHS. Raw data, fully documented and with metadata sufficient to enable independent analysis, will be submitted to DHS for use in potential future data analytics programs. Metadata will include the specific conditions under which measurements are made, such as distances from potential sources of detection events. Specific guidance for data curation will be provided by the government based on the specific research selected.

Award Amounts for Topic Area 2 (TA-02) are anticipated to be up to $500,000 per year, for up to five years. In all cases, the proposed award value should be clearly substantiated by the scope of the effort.

Topic Area 3 (TA-03)
Topic Solicitation Title: Technology Component Improvement for Neutron-Based Active Interrogation

Objective: To further develop neutron active interrogation technology by optimizing detection algorithms, investigating advanced detector implementation, and/or determining neutron source requirements.

Technology Readiness Level at Beginning: TRL 2
Technology Readiness Level at Conclusion: TRL 4
(Note: TRL definitions can be found in Chart at the end of Appendix A.)

Background
Research under this topic will address the challenge of detecting special nuclear material (SNM) and other contraband in conveyances, even when heavily shielded. Neutron-based active interrogation systems are in development under the DHS Mobile Active Interrogation using Neutrons (MAIN) program to detect these shielded threats. Further optimal development of the technology and algorithms employing cutting-edge methods and tools is required for these systems to be ready for deployment. The optimization may come in the form of: detection algorithm improvement; the creation of, or improvement on, specific software tools to support the detection algorithm; simulation and detection studies to inform advanced detector implementation; studies of how to best utilize and analyze signatures of threat materials; or determination of neutron source requirements for a deployable MAIN system.

Description
It is expected that a project meeting the requirements of this topic will investigate potential component improvements through simulation, modelling, and/or experimental studies.

- These improvements may be made by implementing previously untested hardware or software, or by optimizing current techniques.
- It is expected that proof-of-concept demonstrations will be held in a laboratory setting if appropriate to the research.

Successful proposals should focus effort in one or more of the following areas:

- Simulation studies to inform the development of advanced detector technologies, including implementation and best use of currently available technology-leading detector types.
- Study of prompt and delayed gamma signatures to detect SNM. This may include analyses of activation, backgrounds, detector requirements, and/or operational issues.
- Study of detection of contraband such as illicit drugs or explosives. This may include analysis of activation, backgrounds, detector requirements, and/or operational issues.
- Determine requirements for further neutron source development for detection of threats in conveyances, possibly including source strength, pulse characteristics (e.g., rise/fall times,

duty factor, flatness), portability, shielding, and collimation. This sub-topic is not necessarily constrained to currently employed neutron source types.

- Algorithm component development that could support MAIN system development:
    - Pulse processing, including pulse shape discrimination, gain corrections, and time gating. This processing may employ advanced machine learning techniques.
    - Contributions to improve decision making, including contraband identification and increasing confidence in decisions.
    - Development of techniques to fuse data from X-ray and neutron interrogation systems to better inform contraband detection and reduce false alarms.

Aspects of this work may be coordinated with on-going government-sponsored work by MAIN system integrators, in order to provide increased mission impact of the university-based research. Awardees may work with government-furnished data to support feasibility studies, as well as be given opportunities to support the government-sponsored characterization of MAIN technologies. Government sponsored characterization means data collection, data reduction, data reporting and data analysis during government run technology demonstrations. This may include travel for participating students to characterization sites.

Award Amounts for Topic Area 3 (TA-03) are anticipated to be up to $500,000 per year, for up to five years. In all cases, the proposed award value should be clearly substantiated by the scope of the effort.

Technology Readiness Level (TRL) Definitions

Research and Development						
Basic Research		**Applied Research**		**Technology Development**	**Technology Demonstration**	**System Development**
Technology Readiness Level-1	**Technology Readiness Level-2**	**Technology Readiness Level-3**	**Technology Readiness Level-4**	**Technology Readiness Level-5**	**Technology Readiness Level-6**	**Technology Readiness Level-7**
Basic Principles Observed/ Reported	Technology Concept/ application formulated	Critical Function or Characteristic proof of concept	Validation in lab Environment	Validation in Relevant Environment	System Prototypes in relevant environment	System Prototypes in operational environment