MULTIPLE PI LEADERSHIP PLAN

RATIONALE FOR USE OF THE MULTIPLE PI MECHANISM
This proposal encompasses a collaborative effort between two research teams to 1) establish an innovative system that can generate representative secondhand and thirdhand ENDS aerosols and 2) to characterize the physical, chemical, and toxicological properties of the aerosols. The project utilizes individual PI's expertise in particle physics, toxicological science, and analytical chemistry. In this project, Dr. Y. Wang’s research team specializes in aerosol sampling and in situ characterization for air quality research. The contact PI Dr. Y.-W. Huang has more than twenty years of experiences in toxicological research with organic compounds, metals, and nanoparticles. Thus, a multiple PI leadership is appropriate to achieve synergism on evaluating environmental and health impact by ENDS aerosols.

ROLES AND RESPONSIBILITIES
PI, Y. Wang will use the recently developed simulated respiratory system to generate representative secondhand ENDS aerosols following standardized puff profiles and characterize the physical and chemical properties of these aerosols. He will also expose common surface materials to secondhand ENDS aerosols and examine the physical and chemical properties of thirdhand ENDS aerosols under various environmental conditions. PI, Dr. Y.-W. Huang's research team will conduct toxicological experiments and provide input for the design of the simulated respiratory system and in vitro air-liquid interface exposure system. The integration of expertise and experience of the PIs affords a unique opportunity to conduct the proposed interdisciplinary research. Together, the PIs possess complementary skill sets of equal weights. Thus, the implementation of a multiple PI structure is dictated by the nature of the proposed studies.

Importantly, our interdisciplinary team has a track record of collaboration. Drs. Y.-W. Huang and Y. Wang are currently funded by a National Science Foundation project examining the transport and evolution of indoor bioaerosols (NSF 2034198, 2020-2023), and they have co-authored two publications under this project. Both PIs are affiliated with the Center for Biomedical Research (CBR) and the Center for Research in Energy and Environment (CREE) at Missouri S&T, and their collaborations have received seed grants on projects related to environmental health.

COMMUNICATION PLAN
Both PIs have held biweekly joint research meetings for more than two years. They have co-authored three peer-reviewed journal papers. The PIs also interact with each other in monthly meetings of the S&T Center for Biomedical Research. From the beginning of this project, the PIs, along with graduate and undergraduate students, will meet every other week to discuss progress. The engaged students may conduct experiments in the other PI's laboratory. Both PIs will seek advice from the consultants on a regular basis (zoom meetings, phone calls, site visits) and whenever necessary. The laboratories will present joint posters and oral presentations at Society for Toxicology (SOT) and American Association for Aerosol Research (AAAR) conferences. The contact PI will be responsible for communication with NIH and submission of reports. Publication authorship will be based upon relative scientific contributions of the PIs and key personnel.

PROCESS FOR MAKING DECISIONS ON SCIENTIFIC DIRECTION
Both PIs will assume joint responsibility for the development and implementation of all policies, procedures, and processes of the study and oversight of study progress. In these roles, the PIs will be responsible for the implementation of this multiple leadership plan, as well as the dissemination and sharing of data. They will ensure that systems are in place to guarantee institutional compliance with US laws, DHHS, and NIH policies, including those related to biosafety, data management, and facilities.

ACCESS TO STUDY DATA AND RESULTS
All members of the investigative team will have unfettered access to the data generated by the study for the purpose of the preparation of scientific presentations and manuscripts. A series of linked datasets incorporating data, follow-up data, and laboratory data will be integrated into a computing device with a backup system.
Decisions about the allocation of specific writing tasks to study team members or graduate students will be made by the PIs.

**BUDGETARY OVERSIGHT**

Both PIs will participate in budgetary management. Dr. Y.-W. Huang will manage the expenses pertaining to the design, exposure, and outcome assessment of toxicological studies. Dr. Y. Wang will be in charge of managing expenses related to ENDS exposure system establishment and aerosol characterization.

**PROCESS FOR RESOLVING CONFLICTS**

In the highly unlikely event of a substantial conflict between both PIs regarding the conduct of the study, the issue will be resolved by a committee consisting of the chairs of the PIs’ respective departments and the Vice Chancellor of Research and Innovation of the Missouri S&T. Under such circumstances, both PIs agree to abide by the decision of the majority of the committee.

**CHANGE IN PI LOCATION**

If one of the PIs moves to a new institution, attempts will be made to transfer the relevant portion of the grant to the new institution. In the event that a PI cannot carry out his duties, a replacement PI with appropriate specialty will be appointed, subject to the approval of the Office of Vice Chancellor for Research and Innovation and NIH.