REQUEST FOR PROPOSALS  
Human Health Exposure Assessment TIP, 1/04/00

1.) RFP Title: Microenvironmental Modeling

2.) RFP Number: HHEA 1

3.) Introduction and Description of Topic: Many people are confused when they first hear the term “microenvironment” and “microenvironmental model”. The concept has not been used much within the realm of exposure assessors in the chemical industry who often tend to measure exposure directly with measurement. Actually, the concept of the microenvironment is relatively straightforward and the details are presented below. Our aim in developing and using these models is that we will clearly not be able to measure every exposure everywhere. These tools will allow us estimate exposure in many cases without measurement. Their most important value, however, is that they will provide us with insight and knowledge into the basic science of what causes exposures to happen.

This project is designed to survey the general state-of-the-science of microenvironmental model development specifically for predicting the time course of breathing zone concentrations of exposed persons. The results will be submitted for publication in the general scientific literature.

The information provided by this project will primarily be used to inform and advise the CMA HHEA TIP in its efforts to carry out its mission. The HHEA TIP mission is shown below:

Identification, facilitation and communication of generic research that will characterize people’s exposure to chemicals and raise the confidence and lower the uncertainty for quantitative estimates of exposure associated with potential human health effects to chemicals.

This work will summarize the literature and the current ongoing research initiatives for the subject of microenvironmental modeling in a Critical Review Paper.

Background

The field of human exposure modeling is, at this point in time, generally underdeveloped. Many human exposure models that are in use are in some stage of development and have not been rigorously validated. In general, modeling activities tend to utilize default, conservative- overestimating assumptions in the face of a poor knowledge base. It is very difficult or impossible to measure the magnitude of uncertainty and overestimation associated with these conservative assumptions without resorting to expensive monitoring studies. These current limitations of many human exposure models presently in use are poorly communicated. This work will lay the basis for research that would show how exposure predictions might be improved or what additional information might best lower the uncertainty associated and describe the variability associated with model predictions.

The specific origin and background for this request comes from the MICROENVIRONMENTAL MODELING SESSION, CMA Exposure Workshop, CIIT, Research Triangle Park, NC, May 18 and 19, 1999. The summary of the proceedings from this workshop is attached to this RFP. This summary is included to provide the potential contractor with the complete background relative to the scope of topics discussed and considered. It is within the context of the scope of these proceedings that the critical review should be conducted.

Exposure has been defined as the time integral of concentration occurring at the human interface. This has been mathematically defined as:
where $C(t)$ is the functional relationship of concentration with time for the interval $t_1$ through $t_2$. $E$ has the units of ($\text{concentration})(\text{time})$.

The microenvironment defines a compartment in which the person is exposed. Another way of thinking about this compartment is to imagine a scenario where the sources and the subsequent equilibrium concentrations and exposures per unit time are either relatively constant or well characterized. It is also important to think of the sources as occurring within the microenvironment (the near-field) or material coming into the microenvironment from an outside or far-field source.

The cartoon below attempts to illustrate this concept of the microenvironment in which a person’s exposure is impacted by relatively large distant sources and smaller sources in their near-field.

The distant and near sources are ultimately moderated by controlling factors such as dispersion/dilution and physical/chemical loss that impact the exposure to the person in the microenvironment. It is also interesting to note that large but distant sources represent “environmental” exposure which can effect humans and nonhuman targets while near-field sources primarily effect the human(s) in that particular microenvironment.

Within this large scope the participants of the May 18/19 Workshop identified near-field sources and ventilation/contaminant distribution within the near-field as primary but not exclusive research areas.

Previous work in this general area was done by Geomet and reported in 1993. That work rather convincingly documented that uncertainty in the estimation of source terms provides the greatest source of uncertainty in overall model predictions of exposure. The CMA HHEA wants to update and significantly expand upon this effort to not only seek out and evaluate what has been published but also work that has not been published in the peer-reviewed literature (gray literature) and work that is ongoing and not published.

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4.) Project Description

This project is designed to survey the general state-of-the-science of microenvironmental model development specifically for predicting the time course of breathing zone concentrations of exposed persons. The results will be submitted for publication in the general scientific literature.

At least three phases of this project are anticipated:

1. Information gathering – a search and review of published and unpublished or “gray” literature. This includes contacting, interviewing and networking with workers in the field.

2. Synthesis of the available information to identify the current knowledge base, the work underway and the gaps in the available data or knowledge base that are not being sufficiently addressed by current research.

3. Submission of findings and conclusions to a peer-reviewed publication as a Critical Review Paper.

Scope

This work should be limited to microenvironmental models of inhalation exposure or potential airborne breathing zone concentration.

Milestones

Milestone 1. The respondent shall submit a report presenting the results of work on phase 1 and 2 above. Where data gaps exist they will be identified and characterized in some detail by the respondent; however, the respondent shall NOT propose research to address them as part of this project.

Milestone 2. The respondent shall present a paper that has been submitted to a peer-reviewed publication.

Partnership Opportunities

The final report to CMA should indicate who is doing research in these areas along with available operational details of the work and the organizational and historical opportunities that might exist to allow for collaboration with the CMA Long-Range Research Initiative.

5.) Special Requirements

All proposals should include costs for preparing manuscripts for submission of results to peer-reviewed journals. Semi-annual status reports and annual financial reports are required for all funded research projects.

Mention any special meetings that will be held as part of this project that investigators will be expected to attend (e.g., Annual Research Review), unusual or specific data handling capabilities that will be needed for the project; particular laboratory equipment or techniques that should be available to the project; or other unusual circumstances for which investigators will have to plan.

6.) Eligibility

Proposals may be submitted by any domestic or foreign for-profit or non-profit organization, public or private, such as universities, colleges, hospitals, laboratories, or units of State and local governments.

7. ) Funds Available

Total Timing: 6 months from date of award
Funding $50,000-75,000

8.) Review of Proposals

All proposals received in response to this RFP will be reviewed for completeness, responsiveness and merit by the CMA Human Health Exposure Assessment Technical Implementation Panel (HHEA TIP). Incomplete or non-responsive proposals will be returned to applicants without further review. The HHEA TIP is composed of scientists from industry, government, academia, and private sector consultants. CMA’s Strategic Science Team will approve award recommendations.

9.) Review Criteria

The following criteria will be used by the HHEA TIP to evaluate proposals.

- Consistency with TIP research plan
- Compatibility with known skills of investigator
- Quality of proposed milestones/timeline
- Cost effectiveness
- Use of external collaborator/leveraging/networking

10.) Award Criteria

The criteria that will be used in making awards include receipt of a sufficient number of proposals of adequate scientific merit, as determined by peer reviewers; relevance of proposals to the priorities outlined; availability of funds; and program balance.

11.) Submission of Full Proposals

Proposals must be received by CMA no later than February 15, 2000. All proposals must be prepared using the Full Project Proposal Form (attached). The proposal must be signed by an individual who is authorized to sign on behalf of and bind you or your organization to the proposed rates (including indirect costs) and identified Principal Investigators. 

Curricula Vitae for the Principal Investigator and all other key personnel, including subcontractors and consultants, should also be submitted. Ten copies of the proposal should be sent to the following address.

Cheryl O. Morton  
Chemical Manufacturers Association  
1300 Wilson Blvd.  
Arlington, VA  22209

12.) Proposal Procedures

Each applicant will receive a copy of the Full Project Proposal Evaluation Form and Final Project Proposal Selection Form. Successful applicants will receive an award letter from CMA sometime in March 2000.

13.) Inquiries

CMA’s web site cmahq.com contains general information about the Health and Environmental Effects Research Initiative. Questions regarding this RFP should be directed to Cheryl O. Morton at 703-741-5220 or Cheryl_Morton@cmahq.com.

Summary of Timeline for Proposal Submission, Review & Award and Completion

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