

**The Center for Metals in Biology and Medicine (CMBM)
Integrative Molecular Analysis Core (IMAC)
Standard Operating Procedures (SOP)**

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A. Mission

The **Integrative Molecular Analysis Core (IMAC)** is an integral component of the Center for Metals in Biology and Medicine (**CMBM**) COBRE, which represents an exciting opportunity to build on a legacy of metals research at the University of New Mexico (**UNM**) and to support a new generation of scientists. The mission of the IMAC Core is to provide state-of-the-art services that galvanize scientists to conduct innovative research utilizing resources for which costs and expertise are most efficiently and effectively supported as a shared resource. Cores' valuable equipment, scientific knowledge, and technical guidance are accessible to a range of basic science and clinical researchers. The vision of the IMAC Core is to provide a top-notch research infrastructure at the Center that enables scientific excellence, novel methodology development, and outstanding innovations for researchers at UNM HSC and beyond. Along this line, the Core provides in-house analyses, supports innovative protocol development, and provides consultation and training to our users in integrated applications associated with the advanced bioanalytical instrumentation.

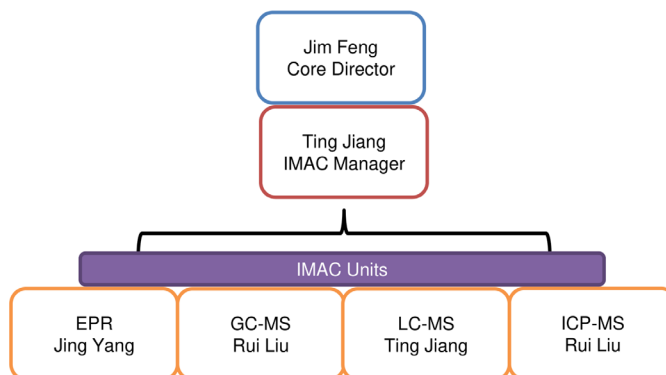
The Specific Aims of this Core are 1) to create a centralized, state-of-the-art resource that provides expertise, training, and instrumentation for integrative molecular analysis, focusing on metal interactions with biological systems; 2) to support the research of mentored PIs and cultivate a new cohort of COBRE investigators within the institution; and 3) develop a user base of investigators for continued growth and sustainability of the core facility.

B. Location, Operation Hours, and Contacts

Location. The IMAC Core Laboratory is located on the ground floor of the College of Pharmacy building (Building # 228, Rooms B52, B54, and B60), along with the office suite in Room B64.

Hours of operation. UNM regular business hours, 9 am – 5 pm; lunch break noon – 1 PM

Organization and Contacts. The organization structure of the IMAC facility is illustrated below. The Core Director and scientists can be contacted via iLab link on <https://goto.unm.edu/imac> or Core email (hsc-imac-core@salud.unm.edu) during regular operation hours.



Shipping & mailing address: IMAC Core, NRPH Room B64
College of Pharmacy
915 Camino De Salud NE
Albuquerque, NM 87131

C. Scheduling, Fee for Service Core Access, and Fee Structure

Tiered Access and CMBM Membership. All researchers from UNM and beyond are welcome to utilize the IMAC Core for services including consultation, training, sample analysis, and method development. The access will be granted in 3 tiers based on the CMBM membership in decreasing priority: 1) active mentored PIs and Pilot Project PIs of the CMBM COBRE; 2) other CMBM members, including the mentors, Center leaders, past mentored and Pilot Project PIs, internal advisory committee members, past and current Core

voucher awardees, as well as investigators with acquired associate membership; and 3) non-members of CMBM, including other UNM PIs and external users outside UNM. Investigators who have research focuses on metal interactions with biomolecules, and wish to gain membership as Pilot Project PIs or Core voucher awardees can apply for the CMBM pilot project or the Core voucher awards that will be announced on an annual basis (<https://unmcmbm.com/about-cmbm/research/pilot-projects/>). To acquire associate CMBM membership, a short presentation to the COBRE IMAC at COBRE (or college/departmental) seminars is required, plus a concise description of the prospective analysis (~1/2 page) and a biosketch. The CMBM executive committee then reviews and approves associate membership.

Scheduling. To prioritize and schedule services, the IMAC will utilize an iLab scheduling system to allow IMAC staff to view upcoming meetings, experiments, and utilization of Core resources. Investigators seeking individual consultation meetings (general service information, experimental design, post-experiment analysis) or training on equipment/procedures will be able to submit their requests via the Core iLab webpage. Within each priority tier, the service will be available on a first-come-first-serve basis. For extremely urgent sample analysis, users may contact the Core Director to request exceptions.

The Core employs the *sample queue workflow*: up to 5 approved service requests will be in each of the current testing queues per instrument, and new samples will not be accepted until a vacancy emerges. This is to ensure that (a) the shared resource will be utilized effectively, (b) the analysis will be completed on time, and (c) there is a clearer expectation in terms of the testing completion timeline. The Core will communicate with the user about the estimated schedule for the Core to carry out their service request.

Fee structure. Our CMBM members receive an institutional discount on all services. The fee structure is to be posted online. Once the service is completed, and the user accepts the results and confirms the completion of the service, an invoice will be sent to the user to initiate payment.

D. Types of Services

In general, there are three types of services provided by the IMAC facility: (1) standard services, (2) consultation/meeting, and (3) tailored method development. Standard service and the other two (e.g., methods development) are different work "streams" and will be handled differently. All requests must be submitted via iLab (https://unmcc.corefacilities.org/service_center/show_external/4947/aim_scientific_core).

Standard Services. The IMAC facility provides two standard services (**Figure 1**): bioanalysis by the Core scientists, i.e., all-inclusive services, and user-accessible analysis.

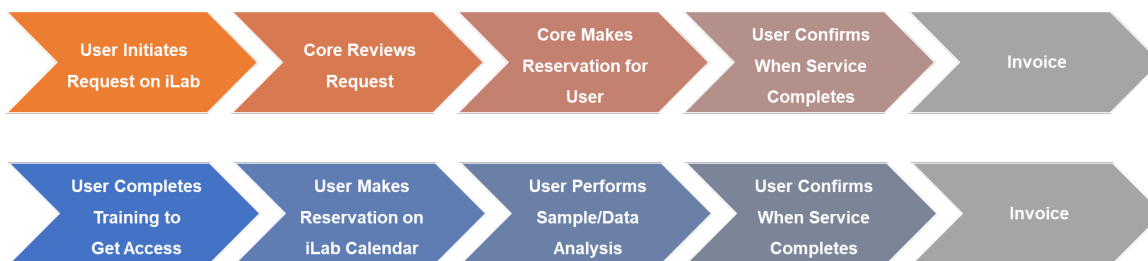


Figure 1. Workflow for requesting the Core services: (Top) All-inclusive services of consultation, instrument training, sample analysis, and method development by the Core scientists; (Bottom) User-accessible services (GC-MS analysis).

For the all-inclusive service request, the Core personnel will review and assess the service feasibility, and then notify the users whether the requests are approved or not. Upon approval, the core scientists will book the machine time on the iLab calendar on behalf of the user. During this process, the Core scientist(s) can be available for meetings to discuss details of the request/experiment upon the user's request. The user will be charged for the consultation meeting, per the fee schedule.

For the request of **using user-accessible GC-MS instrument**, new users can gain the access to both the instrument and reservation calendar on iLab after in-person training and evaluation by the core scientist. The user can then reserve the machine time during regular UNM business hours on the iLab site. Reservation can

only be canceled/changed ahead of time. Users will be billed based on the reserved time. The Core reserves the right to cancel or change the schedule, based on the instrument availability.

Consultation. This includes general service information, meeting with the user, bioanalytical experimental design, and post-experiment meeting/discussion. The mPIs and Pilot Project PIs will receive the first consultation free of charge. To protect the research time and efforts of the Core personnel, the consultation meeting generally tops 30 minutes. Additional consultation including literature research, and data interpretation, will be charged per the actual hours and the Core fee structure.

Method Development Research Services. IMAC will implement a process for review and prioritization of in-house new/tailored methods to develop so that this aspect doesn't become an overwhelming sinkhole of effort. It is at the Core Director's discretion to decide on the type and nature of the user's request (i.e., standard service or research request), which may or may not be in alignment with the user's view.

For requests of consultation and method development, the users are required to provide specific concise information regarding the background, analysis goals, experiment designs, and useful literature with detailed method sections. The Core Director will review the method development request, consult with the content experts, decide on the service feasibility, and then notify the users whether the requests are approved or not feasible at our current technical capacity.

E. IMAC Operational Procedure

Managing the needs of all users comprises challenges on many levels. Finding the balance between service and research is key to Core operation, as is effective communication of the Core's portfolios to users. To proactively address the challenges and better oversee the efforts and resources toward services and research, the Core will operate in a formalized management fashion (**Figure 2**).

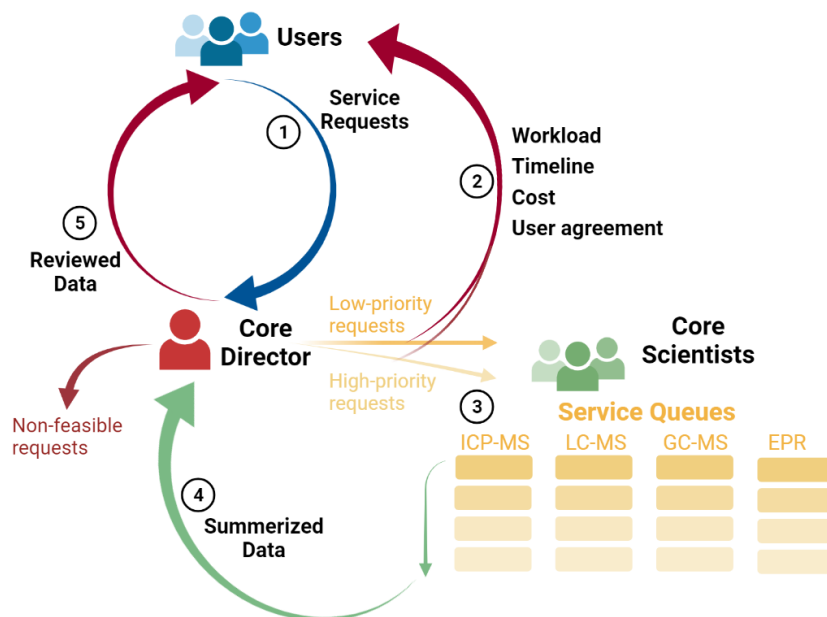


Figure 2. IMAC operational procedure/workflow.

Specifically, the Core Director will review the services requests submitted by the users. The Core can decline service requests if not feasible or request that the prospective users revise their requests. If the request is deemed feasible (see details in **Section F** below), the Core Director will assign the request to the corresponding Core scientist for him/her to generate and distribute a quote on the projected costs. Once the user accepts the quote, the Core scientist will add the request to the queue for processing and testing, based on the priority level determined by the Core, and schedule the sample delivery by the user. After the bioanalysis is done, the Core Director will review the data, and then distribute the data together with any technical note.

F. Project Feasibility Review

A feasibility analysis is used to determine the viability of an idea, such as ensuring a project is technically feasible as well as budgeted justifiable. The Core will determine whether a project is worth the investment - in some cases, a project may not be feasible, primarily based on the following factors (**Figure 3**):

1. Technical feasibility - technical resources currently available to the Core. Whether the technical resources meet capacity, and whether the technical team can conduct the proposed work. The legitimacy factor will also be considered here. For example, Core scientists on immigrant or non-immigrant visa/status are not allowed to perform CBD-related analysis, as such activities could lead to negative immigration consequences under current federal laws.
2. Budgetary feasibility. This assessment typically involves a cost/ benefits analysis of the project. For example, developing a new method for the analysis of a small number of samples is not cost-effective.
3. Scheduling feasibility. The Core estimates how much time the project may take to complete. Delivering results for each project within a reasonable timeline is important to balance the needs of all users.

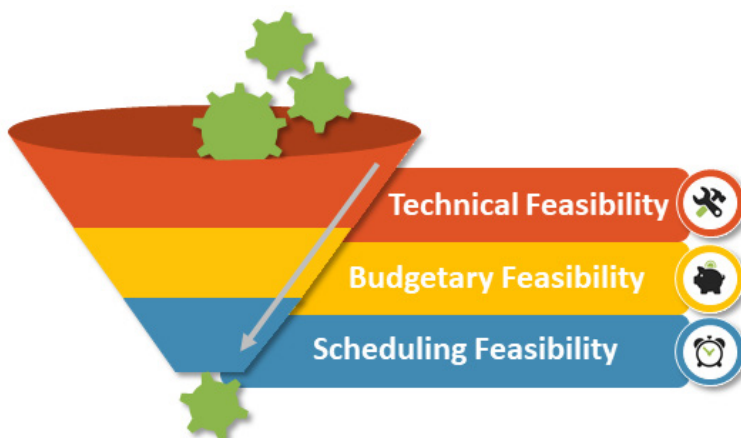


Figure 3. Project feasibility is to be reviewed in three criteria: technical, budgetary, and scheduling feasibilities.

G. Roles and Responsibilities

Roles of Core Director Dr. Feng. The Core Director Dr. Feng is the immediate supervisor of the Core scientists, shepherding their time and efforts. He has the overall responsibility for the operational and fiscal aspects of the IMAC facility. He is the primary contact person for an initial consultation with members of the core to determine the best technical approaches available to answer the specific question for a particular research project. Dr. Feng will review the project feasibility when necessary.

Roles and Effort Distributions of the Core Scientists. It is important that the Core defines, documents, and enforces what will and will not be expected of the core scientists. The heart of the research Core is an emphasis on research rigor and reproducibility. Along this line, the Core scientists provide a wide range of services and support including consultation, design of the bioanalytical experiments, standard sample preparation, and processing (e.g., digestion of solid sample by nitric acid for ICP-MS, trypsin digestion of protein for bottom-up LC-MS proteomics), data acquisition, data analysis, drafting experimental section for publication, GC-MS training, as well as new method development. The Core scientist is responsible for quality control (GLP, SOP), instrument maintenance, and calibration. They are also experts in their analytical fields, and their continued growth will be ensured through on-site and virtual training, as well as a hands-on workshop. They will devote their efforts (% in parentheses) to standard services (50%), method development (20%), instrument maintenance and calibration (20%), as well as consultation including meetings, email, and literature research (10%) (**Figure 4**). This is to prioritize their efforts and better ensure deliverables and research outcomes.

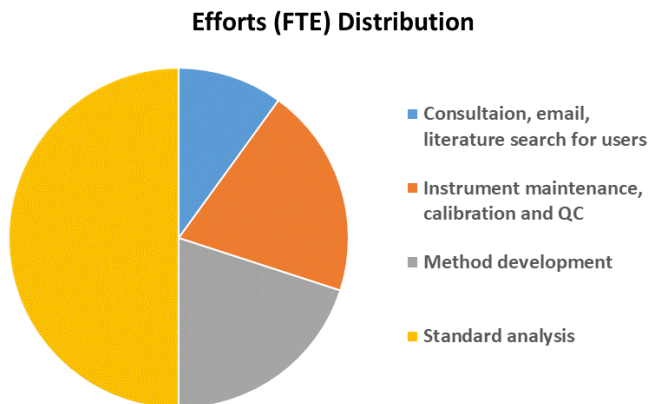


Figure 4. Core scientists' expected effort distribution.

Roles of the users. The users are responsible for their overall study design and associated searches into the literature of their research field. The Users are primarily responsible for providing the samples that are ready for the bioanalysis by the Core, and performing a deeper level of data analysis and interpretation beyond what is typically available in the instrument data analysis software. It is the user's responsibility if the samples do not meet the requirements of the requested instrumental analysis.

As an example, it is more applicable for the users to research the possible options of mass spectrometry experiments than having the core scientists study the literature to identify the suitability of certain analyses for every request submitted by users. The core scientists are not expected to evaluate the scientific merit of the user's project. The Core reserves the right to decline such non-standard requests. *This is to make use of the Core resources more efficiently, and better serve a broad user base.*

- For typical analysis requests, it is the user's responsibility to provide information on commonly utilized chemical reagents, supplies, and analytical methods in the literature.
- For more sophisticated standard analysis, the Core scientists may, upon user's request, assist in reviewing the bioanalysis experimental study design, and advise on the bioanalysis approach including quality control, based on the Core personnel's interpretation of the protocol and/or method documents provided by the user.
- For the bioanalysis consultation service, the Core scientists will suggest, based on their expertise and experience, the best options on possible analysis requested by the users.

For new method development approved by the Core Director, the Core scientists will devote most of their efforts to finding appropriate sample preparation procedures and instrumental analysis parameters that are not provided in the literature, instead of designing or initiating new experiments.

Of note, the users are strongly encouraged to apply for the pilot and/or Core voucher award(s) to better engage, involve, and support the Core scientists in developing in-house tailored protocols and methods. The applications will be reviewed based on the innovation, scientific merit of the proposal, the appropriateness of the project to the overall missions of the CMBM programs, and the likelihood of the research leading to new extramural funding.

H. Data Management

Primary raw data are stored on the computers used for instrument control and data acquisition. These computers will have extra hard drive arrays to prevent data loss due to hardware failure. All computers used for data analysis will be connected to institutional servers, if possible, which are used for backup transfer and archiving primary data. Human subject data will be secured with the appropriate level of anonymity, confidentiality, or de-identification by both the users and the Core scientists.

For sample analysis performed by Core scientists, the Core will provide users with summary reports that document the detailed process of data generation, quality control, and data analysis. Raw data will be archived and shared as needed.

For data generated by the users on the user-accessible instrument, the user is responsible for the backup and transfer of their data. In cases where the computer is connected to the institutional server, the use of any flash drive is forbidden to minimize threats of malware. In other cases where the computer is not connected to the server and a flash drive has to be used, the user is responsible to bring a malware-free one. The Core does not provide a flash drive.

I. Publication Guidelines

The following guidelines are intended to ensure that research performed in IMAC is appropriately recognized and cited. They are compatible with university authorship guidelines, as well as with recommendations of the International Committee of Medical Journal Editors that describe the authorship and what merits authorship in publications (www.icmje.org).

Guideline 1: Any work performed in the Core with assistance from Core staff should be, at a minimum, acknowledged in published work. Please acknowledge the grant support (NIH NIGMS P20GM130422) when publishing or presenting images or data obtained from the Core in manuscripts, abstracts, and presentations.

Guideline 2: The following activities should be acknowledged on manuscripts and grants, but they do not by themselves meet the criteria for authorship.

- Core scientists provided routine training or services for the user.
- Core scientists collected data for users that required technical skills but did not involve the interpretation of data.
- Core scientists reviewed the manuscript or grant for intellectual content or advised on a revision of it.
- A technical question from a referee about data presented in the manuscript required a response from the Core scientist with technical expertise relevant to the project.

Guideline 3: If one or more of the following conditions are met, then the Core scientist should be invited to be a co-author on the manuscript.

- Core scientists contributed significantly to the conception or design of the project.
- Core scientist acquired, analyzed, and interpreted data for the project that required unique expertise and skills.
- Core scientists provided “nonroutine” training and services for a user. This includes the development of novel procedures for data acquisition or data analyses.
- Core scientist wrote a portion of the manuscript (including Materials and Methods, figure legends, or technical details).
- Core scientist approved and took responsibility for the intellectual content of her/his contribution to the manuscript.
- Core scientist produced a figure for the manuscript using data collected by the Core scientist.

Guideline 4: A Core scientist has the discretion to turn down an invitation for authorship if she/he believes that data and interpretation are not consistent with professional standards. The latter may include withdrawal of data or figures from the manuscript generated by the Core scientist.

Guideline 5: Disagreement over the type of recognition or withdrawal of data shall be handled initially by the Core Director who will meet with the user, PI, and Core scientist to help to resolve the dispute. If the Core Director is unable to obtain a solution that satisfies all parties, then the Research Dean of the College of Pharmacy will resolve the dispute. Failure to abide by the decision of the Research Dean may result in loss of privileges to use the Core facility.

J. Safety and others

All UNM HSC policies for laboratory safety must be met. All Core scientists and users must comply with the following policies when in the Core lab area:

1. Anyone in there needs to be older than 16, and has taken basic lab safety training.
2. No food and drink are allowed in the lab area.
3. Clean up the bench and the lab area after each usage. If the workspace is left messy and unusable for the next user, cleanup fees will be charged.
4. Glass and sharps should be disposed into the designated containers instead of regular trash cans.
5. Chemical waste should be disposed of in appropriate containers (e.g., acidic, basic, organic, etc.). If the container label does not contain the name of the chemical that you are disposing of, please add the name to the label.
6. Do not enter the cleanroom B54 area without accompaniment by the Core staff.
7. Do not download or install any software, or browse the internet on the Core computers as they are designated to only operate the instrumentation and/or analyze the data. Compromise of the computers will affect all Core users, and the individual will be responsible for the costs of repair/replacement of the computer and the downtime.
8. In the case where the Core computer is not connected to the server and a flash drive has to be used to transfer data, make sure the hard drive you use is malware-free.

K. Document History

Review Date	Revision Date	Version Number	Signature
Dec. 6, 2021	Dec. 8, 2021	1	Ting Jiang, Changjian Feng
Mar. 7, 2022	Mar. 18, 2022	2	Ting Jiang, Changjian Feng