

TECHNICAL SPECIFICATIONS FOR THE CONTRACTING OF THE SUPPLY OF EQUIPMENT FOR SINGLE CELL PROTEOMICS & GENOMICS/TRANSCRIPTOMICS SERVICES AT THE MASS SPECTROMETRY AND PROTEOMICS PLATFORM AND THE FUNCTIONAL GENOMICS PLATFORM OF THE IRB BARCELONA

I.- INTRODUCTION

The Institute for Research in Biomedicine (IRB Barcelona) Foundation is a foundation created by the Generalitat de Catalunya, the University of Barcelona (UB) and the Barcelona Science Park (PCB), which aims to contribute to the improvement of the quality of life through the application of advances in the field of basic and applied biomedical science, and to promote multidisciplinary research of excellence at the interface between biology and chemistry, as well as to foster collaboration between local entities and institutional research institutes, promoting and coordinating interdisciplinary research in biomedicine. IRB Barcelona has the status of a CERCA center, recognized by the Generalitat de Catalunya.

IRB Barcelona, in accordance with its objectives and the growing demand for access by its researchers to technology capable of addressing complex biological questions within single cell omics context, is preparing to launch a new analysis service on the mass spectrometry and proteomics platform and the functional genomics platform.

To make this new cutting-edge analysis service effective, IRB Barcelona needs to acquire a new Single Cell Isolation, Sorting and Dispensing System for downstream multiple omics (proteomics, genomics and transcriptomics) workflows.

II.- PURPOSE OF THE CONTRACT

The object of this procedure is the supply of a high precision non-contact dispensing system for single cell analysis and sorting as well as large molecule sorting and cloning.

The system must be supplied by a single manufacturer that can guarantee compatibility with the current proteomics and genomics/transcriptomics workflows and that has local support personnel and resources that can guarantee its commissioning and specialized subsequent assistance.

Specifically, all services, provisions and supplies that are necessary for the total and complete execution of the contract in the detailed terms will be included, unless otherwise specified in these technical specifications.

III.- TECHNICAL REQUIREMENTS OF THE CONTRACT

IRB Barcelona needs to acquire a high precision non-contact dispensing system for single cell analysis and sorting as well as large molecule sorting and cloning to effectively set up a new service dedicated to single cell multiomic analysis (object of the contract).

The offer must include and guarantee, as a minimum, the benefits and services detailed below, which are mandatory:

1. Equipment description

The equipment to be purchased must allow:

A single-cell isolation, sorting, and dispensing system with the following requirements:

- Traceable single-cell dispensing accuracy with real-time image verification (brightfield/fluorescence) to exclude doublets, debris, and empty wells.
- User-defined sorting parameters, including cell morphology and multi-fluorescence markers.
- Gentle non-contact acoustic to preserve the maximum viability and clonal outgrowth yields.

The system must be able to cope with the following applications:

- High-throughput multi format cell dispensing capabilities.
- Compatible with general use SBS-format plastic plate formats, including 24-/96-/384-/1536-well plates
- Temperature-controlled (4–37°C) and humidity-stabilized workflows to prevent evaporation and ensure reproducibility and compliance with protocol guidelines
- Cell Line Development (mAb, CRISPR, IPS, Stem Cells, etc.)
 - Image documentation for regulatory compliance (e.g., monoclonality proof).
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- Miniaturized Workflows for Genomics and transcriptomics
 - Nanoliter dispensing to minimize reagents usage when compared with the existing automated platforms
 - Single Cell applications for NGS library preparation: scRNA-Seq, scWGS, scATAC-Seq, other protocols.
 - Reduced dead volumes for rare samples.
 - Bulk reagent dispensing for miniaturized lysis buffer, master mix, or barcoding reagents.
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- Single Cell Proteomics: end-to-end sample preparation protocols prior to mass spectrometric analysis for both multiplex and label-free workflows.
 - Automated transfer of single-cell digests to Evtips (for Evosep/Bruker timsTOF systems) achieves 4,000 protein groups per cell.
 - ProteoCHIP™ Evo96 compatibility to enable pipette-free sample prep for mass spectrometry.
- Complementary to FACS
 - Handles fragile/large cells (2–70 µm) unsuitable for FACS, including microbeads, bacteria, and nuclei.
 - Isolation of Rare Cells (Circulating Tumor Cells, etc.).

Isolation of Single Microorganisms (bacteria, spores, microalgae, diatoms, pollen, yeasts, etc.)

Operation mode

A micro-dispensing capillary should be used to dispense liquid droplets of very small volume (100-600 pL) on different surfaces, driven by an XYZ axis system. The position of the droplets on the substrate of interest should be adjusted with high precision (up to a positional accuracy of 3 µm), and any positional pattern must be adjusted according to the user's needs.

It should allow for the deposition of any type of liquid, such as suspensions containing particles and ensure the isolation of single, unique cells and specifically targeted cells.

In operation, the instrument should be able to generate reports showing the number of particles detected per volume of liquid, as well as the distribution of the measured parameters among these particles, including size, elongation, circularity and fluorescence intensity, if present.

Technology required:

- Cells should be dispensed in small, volume-adjustable subnanoliter droplets, allowing for extreme miniaturization of assays and dramatic savings in reagent cost.
- Droplets should be dispensed with microarray-like precision and accuracy with typical spot pitches of up to 100 microns on any standard and on 96-, 384-, or 1536-well plates, nano-well cups, slides, or custom substrates.
- A second dispensing channel to allow for additional on-board sample preparation.
- Environmental control, including temperature control for substrates of interest, and humidity and dew point control to further enhance sample integrity and prevent evaporation.
- In addition to the high-resolution brightfield microscopy mode, cells should also be fluorescently interrogated in four different channels: green, red, orange and blue.
- Piezo-driven acoustic dispensing technology preserving the viability of the dispensed cells.
- Cells from 2 to 80 μm in diameter could be detected in brightfield mode, while cells less than 2 μm in diameter can be detected using fluorescent mode.
- Images of the droplet containing isolated single cells and of the cells as they progress toward the portion of the dispensed droplet nozzle should be available for real-time observation and should also be preserved for documentation of uniqueness and review of morphological characteristics.
- Only a few microliters of sample should be required, and recovery rates for rare cells must be at over 90%, with no sample waste. Cells that are not isolated have to be recovered and reprocessed if necessary.
- The equipment should be compatible technology that enables complete, end-to-end and miniaturized sample preparation protocols for single cell Proteomics:
 - 192-well nanoliter chips designed for single cell isolation and automated sample preparation for mass spectrometric proteomics analysis labeled with TMT.
 - 48-well microliter chips designed for single cell isolation and automated sample preparation for label-free mass spectrometric proteomics analysis.
 - 96-well microliter chips designed for single cell isolation and automated sample preparation for label-free mass spectrometry proteomics analysis with direct transfer to Evotips to minimize sample loss.

Essential features required in the equipment:

- The System should allow not only the sorting and isolation of cells, but also the precise dispensing of ultra-low volume (pL to nL) reagents and environmental controls (temperature, humidity, humidity) that allow miniaturization of sample preparation

- workflows on the instrument, i.e. for genomics, single cell transcriptomics and proteomics. Should not require additional instrumentation (reagent dispensers, incubators, etc.).
- Capable of sorting and isolating cells from 0.5 to 80 μm , even within the same sample.
- Ensure that only single cells are isolated (up to 100% of single cells. Should not rely on statistics (e.g., Poisson distribution) and should have control over what is actually dispensed.
- Should takes pictures of all cells while maintaining a relatively high isolation rate (~40 cells/minute).
- No sample waste. Cells that are not isolated on the substrate of interest should be recovered and reprocessed if necessary.
- Compatibility with standard and customized laboratory equipment
- Acoustics-Based Precision Dispensing with Piezoelectric Dispensing Capillary:
 - Glass capillary
 - Piezoelectric ceramic
 - Volume ~ 300 pL/drop
 - Droplet Frequency ~ 500 Hz
 - CV < 0.2%
 - Compatibility with aqueous and organic solutions
 - Single cell isolation ~ 40 cells/min
 - Single cell accuracy up to 100%
 - Cell selection: brightfield (size and morphology) and/or fluorescence (4 channels)
 - Low shear stress accumulation
 - Image recording of isolated cells
 - Sample volume from just 1 μL - ideal for rare and tiny samples

Acquisition and processing system

- The system has to include a computer for the acquisition and control of the instrument and the corresponding software.
- Should contain the an Omics Package for workflow miniaturization and automation.
- Should Include functions, runs, tasks, targets and fields, required to perform single cell proteomics workflows.
- The equipment should be supplied complete with all its main and auxiliary elements to achieve the functionalities described in the previous points. Consequently, it will include the following list of equipment, which is not intended to be exhaustive: computer, screen, keyboard and mouse, or any other elements necessary for the correct operation of the equipment.

2. Installation, execution and maintenance

The location of the Equipment will be in the new Cytometry Platform of IRB Barcelona located in the cluster I building of the Barcelona Science Park, carrer Baldri i Reixac 10, 08028 Barcelona.

The supply must include transportation, location, unpacking and electrical connection or the different necessary supplies.

The equipment will be supplied complete, being new, including all the elements necessary for correct installation. The successful bidder must be responsible for the installation and commissioning of the new equipment until it is in proper operation, including in the budget

the assembly and all the infrastructures that are necessary to install them in the corresponding laboratory.

The equipment and components offered must comply with the applicable national and European regulations. The equipment to be supplied must have the corresponding CE marking or the absence of the marking must be justified. The equipment must be delivered with the CE declaration of conformity and instruction manual in Spanish or English.

Regarding the software supplied with the equipment, its maintenance by the supplier and migration and updating to improved versions that arise will be required.

2.1 Requirements to be able to connect the computer to the computer network

The instrument should be connected to the IRB-PCB computer network. The technical requirements to enable the computer are:

- Windows 10 LTSC 2019 OS with permission to install Microsoft security patches. If it is not Windows 10 LTSC, it must be a Windows OS with support from Microsoft for a minimum period of 5 years.
- The IRB will apply Microsoft patches to the equipment during its useful life, so the instrument software must be compatible with the patches published by Microsoft.
- The manufacturer may develop and apply patches to its own software, at no cost to the IRB and within a maximum period of two months, that allow this compatibility.

The software must be compatible with a Next Generation Antivirus provided by IRB Barcelona. IRB Barcelona currently installs CrowdStrike. If antivirus software is not recommended because of unforeseen incompatibilities, the provider will offer other means in order to have proper instrument control of the computer.

3. Training plan

A training course must be offered for all staff Core personnel designated in charge of the instrument upon completion of the installation of the system.

Support must be provided for the installed applications and a training plan must be provided on an ongoing basis in the different areas of instrumental application.

4. Delivery schedule

The deadline for delivery of supplies will be 3 months from the formalization of the contract, unless a shorter period is offered.

5. Warranty

The equipment must have a warranty, which will be a minimum of 2 years, starting from the receipt of the supply, and will include spare parts, labor, transport, travel, etc.

The successful bidder will be responsible for the correct provision of the services included in this guarantee and during its validity, with the final guarantee deposited at the time of awarding the contract.

6. Technical documentation

The contractor must submit with the technical offer an official factory document with a detailed technical description of the characteristics of the equipment offered.

The manufacturer's responsible declaration must be provided certifying that the proposed equipment complies with all technical requirements and those indicated in the technical assessment criteria, as well as safety compliance with international organizations.

The system to be installed must be sufficiently tested in installations of similar characteristics, and the bidder must attach a list of references for installations of the product offered with details and a contact person to whom to turn in case of doubts or queries about the product.

Barcelona, on the date of the digital signature.

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