



DIPARTIMENTO DI SCIENZE MEDICHE E CHIRURGICHE

Modulo richiesta assegno

TUTOR	Ivana Kurelac		
PRODUZIONE SCIENTIFICA TUTOR			
Punteggio VRA	0.80		

Commissione proposta 3 commissari + 1 supplente	Prof.ssa Luisa Iommarini
	D.ssa Manuela Sollazzo
	D.ssa Chiara Diquigiovanni
	Prof.ssa Elena Bonora (supplente)

TITOLO DEL PROGETTO		
Development of single cell label free analyses for cancer biology applications		
ASSEGNO FINANZIATO DA PROGETTO COMPETITIVO <i>(barrare la casella corrispondente)</i>	<input checked="" type="checkbox"/> SI	<input type="checkbox"/> NO
SE IL FINANZIAMENTO È COMPETITIVO L'ENTE FINANZIATORE	MUR PRIN 2022 "COLLECT" MUR PRIN 2022 PNRR "CORRECT"	
PROGETTO/ATTIVITÀ A SCOPO COMMERCIALE <i>(es. sperimentazione profit)</i>	<input type="checkbox"/> SI	<input checked="" type="checkbox"/> NO
CARATTERISTICHE DEL PROGETTO <i>(biomedico/osservazionale/clinico-interventistico/multidisciplinare)</i>	Biomedico	
STATO DI APPROVAZIONE DEL PROGETTO DA PARTE DEL COMITATO ETICO <i>(se necessario per il tipo di studio barrare o evidenziare la casella corrispondente)</i>	<input type="checkbox"/> Ottenuto <input checked="" type="checkbox"/> Non applicabile	<input type="checkbox"/> Da ottenere
DESCRIZIONE DEL PROGETTO <i>(max 800 parole)</i>		



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Background: Accurate and high-throughput cell sorting is the key technology in molecular and cellular biology, biotechnology, and medicine for applications that require the study of cell populations heterogeneity, such as analyses of tumor microenvironment (TME) populations in solid tumors or in the context of liquid biopsy (LB).

Objectives: The principal objective of this research is to develop a label free method for detection of cancer cells and tumor infiltrating lymphocytes in the context of breast and ovarian cancer. Demonstration of the technology's utility applied to various types and sizes of cells is the general aim of the proposal.

Methods and material: Opto-mechano-fluidic platform for cells separation will be applied, via computational intelligence-aided image-activated morphology and deformability-based discrimination, by integrating two complementary facilities, namely, a label-free imaging module for bio-particle mechano-sensing and a microfluidic device for intelligent cell sorting activated by real-time deep-learning-assisted imaging analysis. Holographic microscopy will be employed to image and quantify the cell biomechanics thanks to its ability to achieve *a posteriori* multiple refocusing, label-free and full-field quantitative phase-contrast imaging. As models for the study commercially available breast and ovarian cancer cell lines will be used, together with the commercial models of blood and solid tumor microenvironment cell populations.

Expected results/impact: The proposed technology is expected to supply high flexibility, high scalability, and fully automated data acquisition and processing, decision-making, and actuation, thus guaranteeing high standards in terms of performance, versatility, and economic convenience. In particular, the project intends to set the basis for molecular-marker-independent sorting of cancer and tumor microenvironment populations, which will certainly drive discoveries in basic preclinical research, and also be immediately useful, for example, in cancer contexts in which TME cell populations are regarded as markers for differential diagnosis, disease grading, and predicting therapy response.

Fellow training and research activities: The fellow will be principally involved in the following two tasks of the project: (i) Generating dictionaries of various cell populations via studying morpho-mechanical properties with holographic imaging and (ii) Validation of the technology by comparison with current golden standard methods for TME and LB analyses in oncology. Training in flow cytometry and histology is planned, as well as short visiting periods at the Institute for Applied Sciences and Intelligent Systems (CNR, Pozzuoli) to get acquainted with the holographic microscopy. Moreover, the fellow will participate at weekly lab meetings, where both discussion of other projects and presentation of the proper are envisioned.

DESCRIZIONE DELLE ATTIVITÀ DELL'ASSEGNISTA

*(per i **nuovi** assegni: max 400 parole; competenze richieste, scansione temporale della formazione, scansione temporale dell'attività, obiettivi primari e secondari)*

*(per i **rinnovi**: max 600 parole – da integrare con la relazione dell'assegnista; formazione raggiunta, attività effettuata, obiettivi raggiunti/competenze acquisite, formazione ancora da acquisire (se pertinente), scansione temporale dell'attività durante il rinnovo)*

Punti



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The candidate is expected to have an extensive experience in cell biology techniques (including Incucyte) and sample preparation for single cell processing. Training will be organized mainly throughout the first 6 months of the fellowship.

Tasks include: cell model maintenance and preparation for holographic microscopy (months 1-4); troubleshooting for sample processing (months 3-6); validation of cell recognition by immunocytochemistry and flow cytometry; validation of cell viability/functionality with post sorting assays, such as cancer cell proliferation, live/dead cell count and cytotoxic activity of T lymphocytes (months 7-12)

The fellow will be performing data analysis and troubleshooting discussions, as well as maintaining contacts with collaborators (months 1-12).

Finally, the fellow is expected to prepare and present project proceedings on congresses, and contribute to scientific paper writing (months 7-12).

Primary objective: Demonstrating the label free approach is capable of discriminating breast/ovarian cancer cells from T lymphocytes and monocytes (month 6).

Secondary objectives: Demonstrating label free approach is more efficient than immunocytochemistry and flow cytometry in discriminating breast/ovarian cancer cells from T lymphocytes and monocytes (month 12).

SE RINNOVO, SI RICORDA DI ALLEGARE ANCHE LA RELAZIONE DELL'ASSEGNISTA CON LA SUA PRODUZIONE SCIENTIFICA.

Scheda attività assistenziale (se prevista)

ATTIVITÀ ASSISTENZIALI DELL'ASSEGNISTA/ N. ORE SETTIMANA (max 18 ore settimanali)

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AZIENDA SANITARIA PRESSO CUI SI SVOLGERÀ L'ATTIVITÀ

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Si ricorda che, come previsto dagli Accordi sull'impiego nell'attività assistenziale dei Titolari di assegni di ricerca, sottoscritti tra l'Università di Bologna e le Aziende Ospedaliere di riferimento, una volta stipulato il contratto con il vincitore della selezione, il tutor deve consegnare alla Direzione Medica Ospedaliera la relativa modulistica, nella quale andranno riportate le attività qui segnalate.