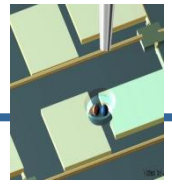


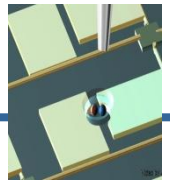
The COCHISE Project

Cell-On-Chip biosensor for detection of cell-to-cell interactions
IST-034534

Roberto Guerrieri
Università di Bologna

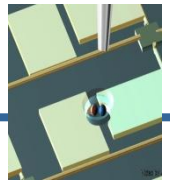
MNBS Workshop

Outline



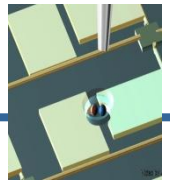
- Summary of the COCHISE project
- Main achievements
- Technology offer and challenges
- Potential non-research collaborations

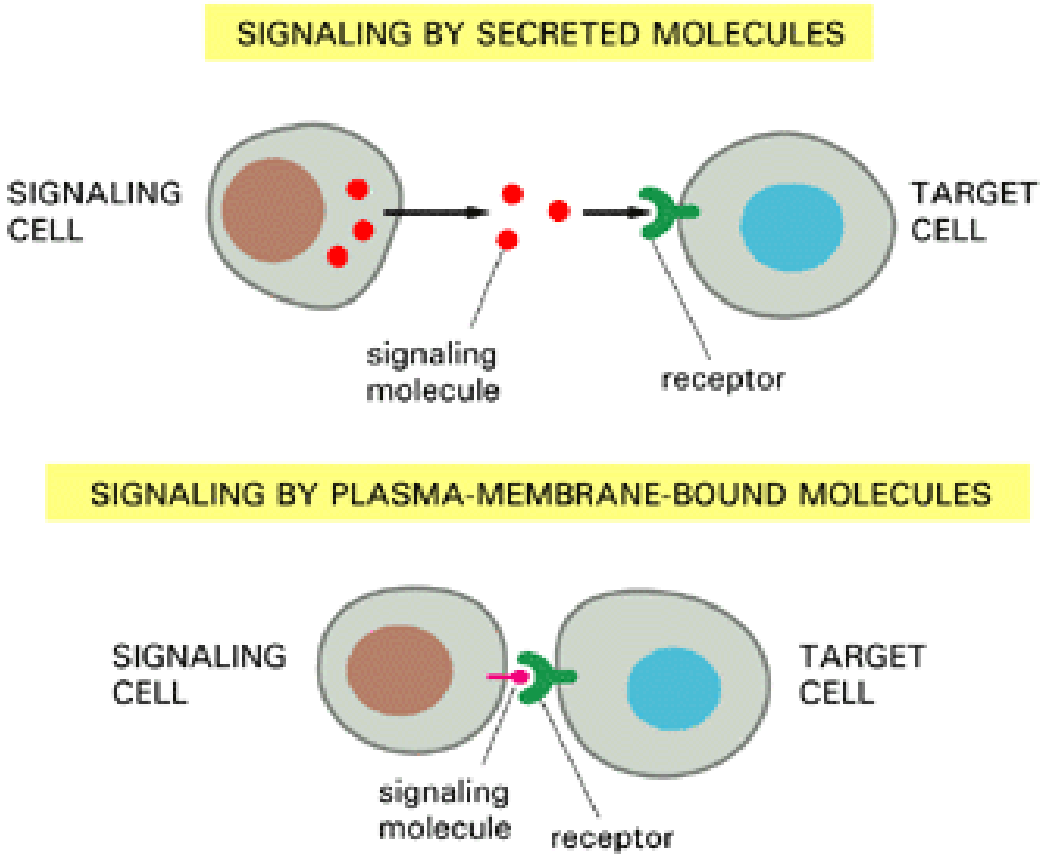
Project partners



- ARCES – University of Bologna, ITALY
- University of Ferrara, ITALY
- Fraunhofer IZM, GERMANY
- Micronit Microfluidics, NETHERLANDS
- Institute of Cellular Pathology (ICP), BELGIUM
- Commissariat à l'Energie Atomique (CEA), FRANCE
- Aziende Chimiche Riunite Angelini, ITALY
- MindSeeds Laboratories, ITALY

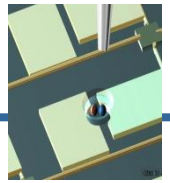
Project goal

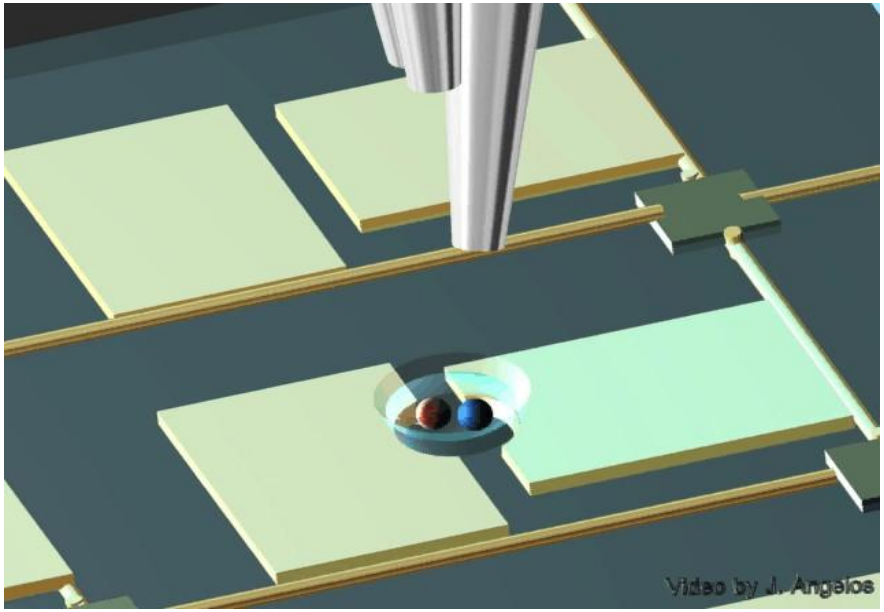


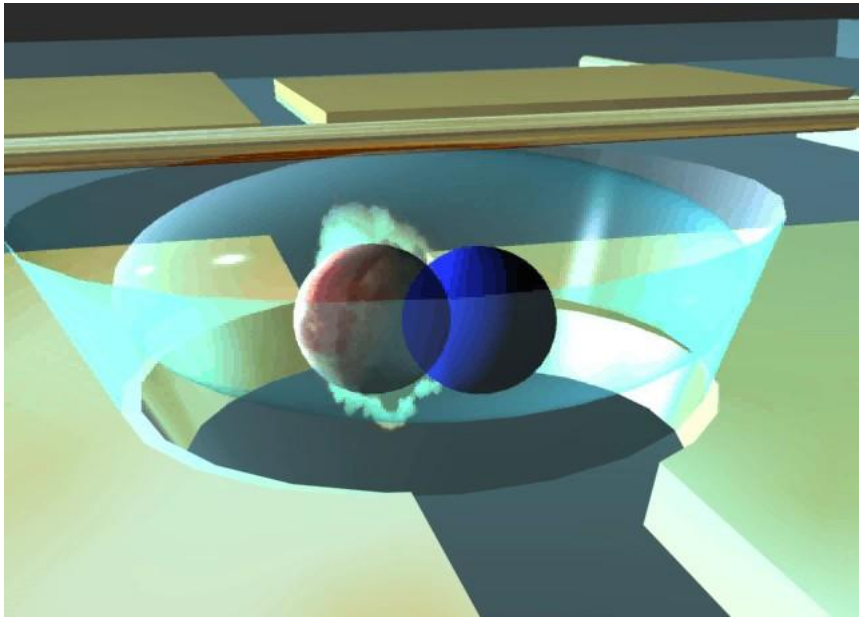


- Design and implementation of platforms for the study of immune system activity
- Focus on lysis induced by effector cells on target cancer cells
- Platform with the capability to induce contact between cells and detect lysis in microwells
- Dielectrophoresis used to control cell position

System architecture

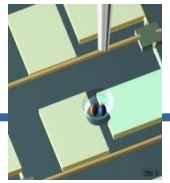




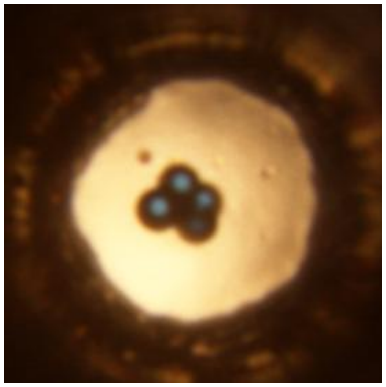


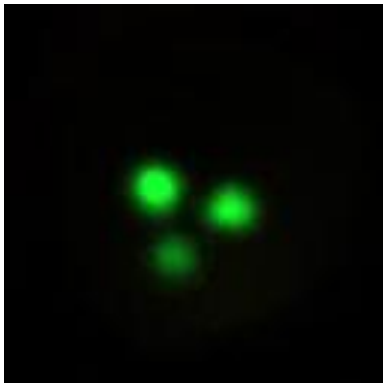
- Parallel smart microtiter system
- Spotting of cells chosen among suitable candidates
- Cell contact through field-induced dielectrophoresis

DEP trapping

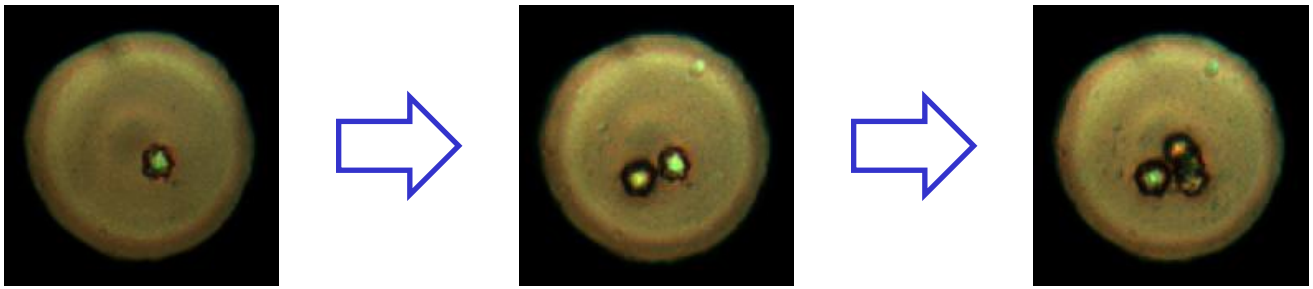


- Clusters of beads and target cells (FITC fluorescence)

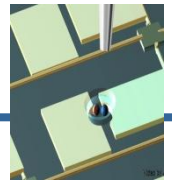




- Sequence of NK cells trapped in a well and forming a cluster

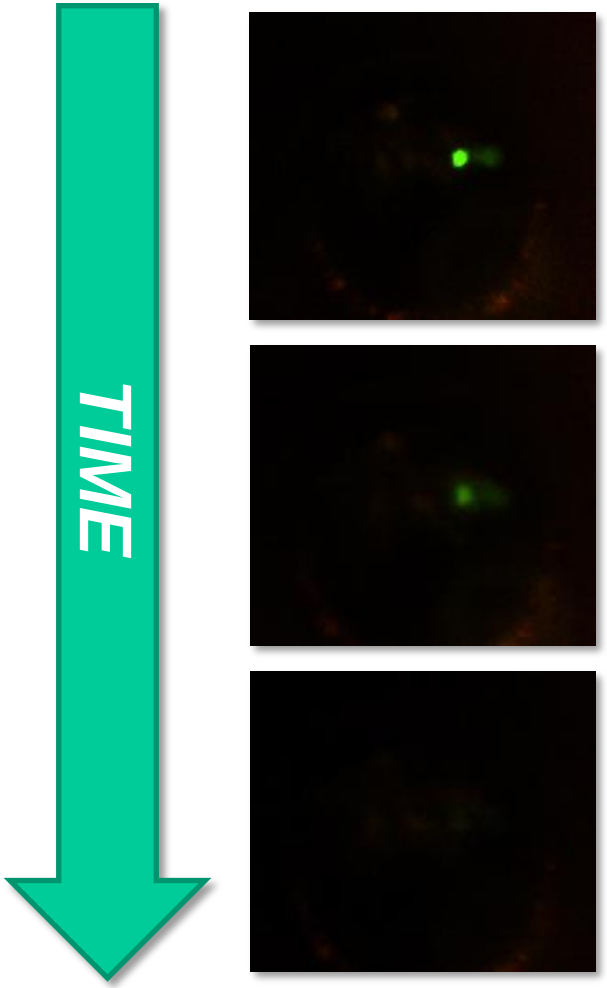


Isolation of active immune cells



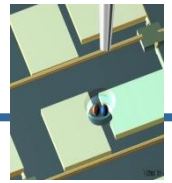
Isolation of active immune cells (CTL, NK) on the basis of a functional assay

- Target tumor cells (K562) stained with fluorescent dye are delivered in microwells
- Immune cells are delivered in the same well
- Loss of fluorescence occurs in case of tumor cell lysis
- Active CTL and NK cells are eventually recovered from the platform

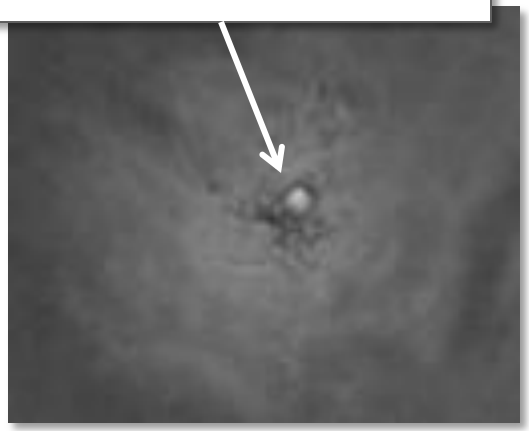


http://www.technologyreview.com/biomedicine/24020

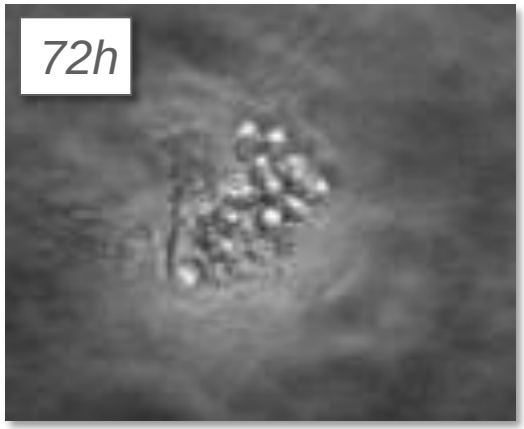
Viability of recovered cells

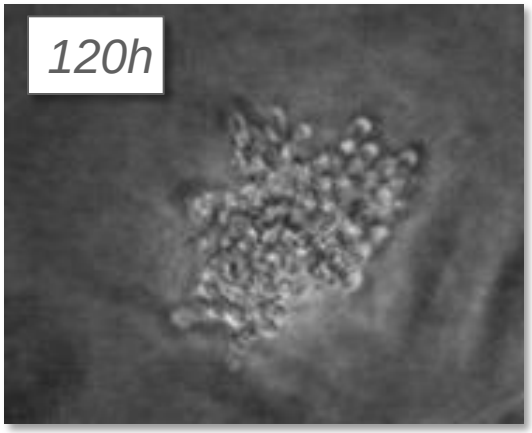


Single K562 cell transferred onto 96-well microtiter



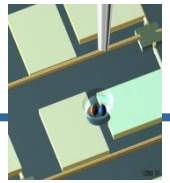
- Cells recovered in standard microtiter plate
- Single-cell growth after recovery is successfully demonstrated





time

Technology challenges



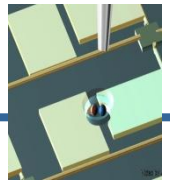
Challenges and opportunities:

- Need to industrialize the fabrication process based on flexible PCB technology
- Integration of complex microfluidic control system (pumping, valving, etc.)
- Integration of imaging system

Applications:

- Immunology
- Drug screening

Contacts



- Website: http://cochise.arces.unibo.it

- Roberto Guerrieri, University of Bologna (project coordinator)
  - E-mail: roberto.guerrieri@unibo.it