

Lens-free intereferometric microscopy (LIM)

Label-free detection of biomarkers



CFO⁹ at a glance

- **Founded in 2002**
- **400+ People**
- 25 Research Teams
- **14000 m**²
- 60 Research labs
- Research, Grad Education, KTT



- 17000+ citations/year
- 200+ PhD graduates
- 50+ Industrial projects
- 37 ERC Grants

project incubated a

• 7 spin-off companies



ICFO's bridge to all types of industries, hospitals and corporations

A space and support structure which allows innovative ideas to develop into new technology spin-offs

Spin-offs



ତ QUSIDE **□DROPLITE**

L* ProCareLight





Silica patterns: 10 nm-thick

LIM - Key Performance

- Detection range (z): 0.1nm 100nm
- Image resolution (x-y): ~10µm
- Field-of-view: 5mm x 7mm
- No mechanical scanning or focusing
- Size: Benchtop (30x40x50cm)
- Imaging Source: 4 color LED / tunable laser
- Measurement Time: <1min / color

Optical quality Material science





Metrology







Label-free biomarker detection

Optical reader

Lens-free Interferometric Microscope (LIM) + Plasmonic field enhancement

Microarray cartridge





Biomarker detection



Limit of detection: 500 ng/mL

Preliminary limits of detection: 10 ng/mL with a commercial chip 50 pg/mL with a secondary step

 Science Advances, 2016 (DOI: 10.1126/sciadv.1600077)
Nature Light: Science & Applications, 2018 (DOI: 10.1038/lsa.2017.152)

Bio-film sensitivity ~ 0.1 nm (Optical path difference)

No need for labeling

A project incubated at

Case Study: Sepsis (pre-clinical test)

- **Sepsis** is a whole-body inflammatory reaction
- Caused by severe infection
- 35% mortality
- > 7 million deaths/year
- > €10 billion in hospitalizations (EU and USA in 2008)







Case Study: Sepsis (pre-clinical test)

Detection of 3 biomarkers in samples from real patients

- Escherichia Coli (E.Coli, bacteria) Sensitivity : 1 cell/sample volume (150µL)
- C-reactive Protein (CRP, protein) Sensitivity: 500 ng/mL
- **Procalcitonin (PCT, peptide)** Sensitivity : 50 pg/mL (with a secondary step)

Clinical relevance

- Pre-clinical tests carried out at Hospital de Vall d'Hebrón in Barcelona.
- Accurate differentiation between bacterial sepsis patients, healthy individuals and systemic inflammatory response syndrome patients.

Partners:











Key Performance



- Label-free bio-sensing platform
- Rapid (30min)
- High bio-film sensitivity (< 1 nm)
- High biomarker sensitivity (ng/mL)
- Microarrays (up to 10,000 tests)
- Detection from miRNA to E.Coli
- Low sample volume (100uL)
- Inexpensive cartridge (< 10€)
- Patented Technology

What we look for

- Industrial partners for large-scale manufacturing
- Other potential applications