

(Bio)sensori elettrochimici miniaturizzati e AI

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(Bio)sensori elettrochimici miniaturizzati



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(Bio)sensori sostenibili



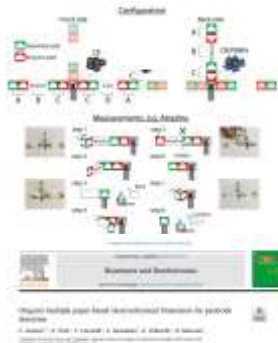
3

Paper-based (Bio)sensors

Paper-based as sustainable substrate



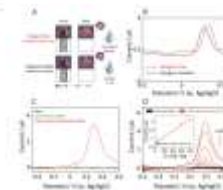
Paper-based origami device for multiple analysis



Paper-based reagent free device



Paper as reactor



4

Paper-based lab on a chip

Paper-based device for aerosol samples

Paper-based device for solid samples

Paper with hybrid system

5



(Bio)sensori per la rilevazione rapida di infezioni

Design	Phenomenon	Year of Design	Target Analyte	Mode	Volume	pH	Reference
1	Glucose	2005	Glucose	Amperometric	100 µL	7.4	[1]
2	Glucose	2006	Glucose	Amperometric	100 µL	7.4	[2]
3	Glucose	2007	Glucose	Amperometric	100 µL	7.4	[3]
4	Glucose	2008	Glucose	Amperometric	100 µL	7.4	[4]
5	Glucose	2009	Glucose	Amperometric	100 µL	7.4	[5]
6	Glucose	2010	Glucose	Amperometric	100 µL	7.4	[6]
7	Glucose	2011	Glucose	Amperometric	100 µL	7.4	[7]
8	Glucose	2012	Glucose	Amperometric	100 µL	7.4	[8]
9	Glucose	2013	Glucose	Amperometric	100 µL	7.4	[9]
10	Glucose	2014	Glucose	Amperometric	100 µL	7.4	[10]

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Progetti Internazionali



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Progetti Internazionali

In European countries, more than 9 million healthcare-associated infections are reported each year, of which many are related to prosthetic devices used in surgical procedures. How to help to manage this issue? SENSIF has a vision that new technologies, including sensing, printing techniques, and advanced data-analysis using artificial intelligence, can develop an accurate point-of-care device for fast diagnosis of periprosthetic joint infection (PJI). The glucose sensor strip has largely improved the quality of life of diabetic patients and reduced the cost of the management of diabetes. SENSIF will develop a point-of-care device, analogous to the glucose strip, with the advantage of i) multi-biomarkers detection in a single measure assisted by artificial intelligence-based analysis for fast, on-site, and accurate patient-specific diagnosis and ii) to be a paper-based device, which is both cheap and environmentally friendly. Our starting point relies on the first sensor for infection detection by analysing blood sampled during orthopaedic surgery, developed by coordinator of SENSIF together with a partner of SENSIF consortium. Starting from this point, SENSIF device will furnish information on PJI during the physician visit by sampling synovial fluid with generating almost instant analysis results. This will reduce the need for specialized, time-consuming, and expensive assays and remove the need for revisits to discuss the outcome and prognosis: in only a single visit.



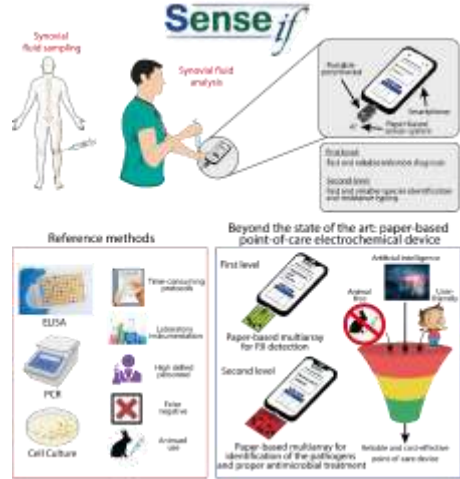
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Progetti Internazionali

2018 ICM criteria for PJI definition

MAJOR CRITERIA	DECISION	
Two positive cultures of the same organism	INFECTED (at least one of the following is present)	
Stains tract evidence of communication to the joint or visualization of the prosthesis		
MINOR CRITERIA	SCORE	DECISION
Elevated serum CRP or D-dimer	2	≥4, infected 2-3, possibly infected 0-1, not infected
Elevated serum ESR	1	
Elevated synovial WBC count or LE	2	
Positive synovial alpha-defensin	3	
Elevated synovial PMN (%)	2	
Elevated synovial CRP	1	

CRP = C-Reactive Protein; ESR = Erythrocyte Sedimentation Rate; WBC = White Blood Cells; LE = Leucocyte Esterase; PMN = Polymorphonuclear Cells.



Progetti Internazionali

Trends in Analytical Chemistry 17(1) (2014) 1-17

View this article on ScienceDirect

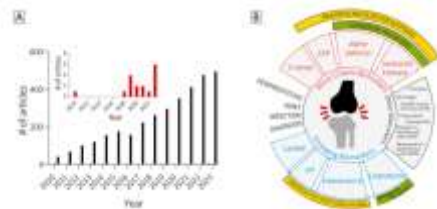
Trends in Analytical Chemistry

Journal homepage: www.elsevier.com/locate/tacl

Point-of-care devices for the detection of biomarkers of periprosthetic joint infection: State of the art and future perspectives

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Progetti Nazionali



Progetti Nazionali

Periprosthetic Joint infections (PJI) and spondylodiscitis are considered some of the most costly infectious diseases. **Ortho-PoC** will face this issue with a smart and highly innovative diagnostic tool, starting from the point-of-care device (PoC) developed and published by the coordinator and one partner of this project, FPG and UTV ("Fast and reliable infection diagnosis during orthopaedic surgery using Bluetooth-assisted miniaturized-electrochemical sensor"[doi:10.1016/j.microc.2022.108061](https://doi.org/10.1016/j.microc.2022.108061), based on PoC for pH analysis in blood sampled close to PJ during surgery). **Ortho-PoC** will further go beyond the state-of-the-art with a PoC for multiparametric analysis i.e. pH, lactic acid, and white blood cells in easily collected synovial fluid and pus. Several samples will be analysed using **Ortho-PoC** at three different Hospitals (FPG, PRF, PVN) and the data will be treated with artificial intelligence (AI) to deliver an AI-assisted robust, effective, and smart PoC for PJI and spondylodiscitis

Task	2023	2024	2025
Aim 1	[Red bar]		
Ethical committee			
Recruitment 1			
Recruitment 2			
Aim 2	[Red bar]		
Development and Production of paper-based microfluidic array			
Development and Production of the sensor for the measurement of pH			
Development and Production of the biosensor for the measurement of lactate			
Development and Production of the sensor for the measurement of white blood cells			
Mass-production of Ortho-PoC device			
Aim 3	[Red bar]		
Development of a dedicated App			
Sensors integrated with AI			
Exploration, Patient filed			
Communication and Dissemination activities			





BIAPTABONT Project
PATCHSTRESS Project
SMILE Project



Project NanoSWS

Application of Miniaturized sensors and sample to Mini Unmanned Aerial Vehicles



University of Rome Tor Vergata
NanoSPES Project



H2020-SME instrument
SWaT project



Water 4.0



SMARTMASK4CF



INNOCONCRETE Project



Programma Nazionale di Ricerca in Antartide - PNRA
PNRA18_00184



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