

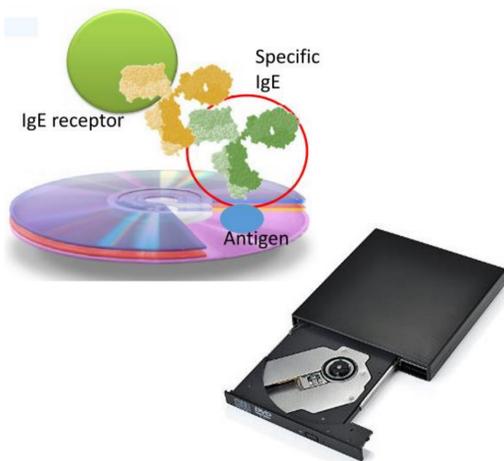
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DRUG ALLERGY DIAGNOSIS

Drug hypersensitivity to antibiotics, mainly β -lactams (BLCs) affects more than 2.5 million European citizens. Moreover, preventable adverse drug reactions are estimated in additional hospitalization costs of 1750-4500 €/patient.

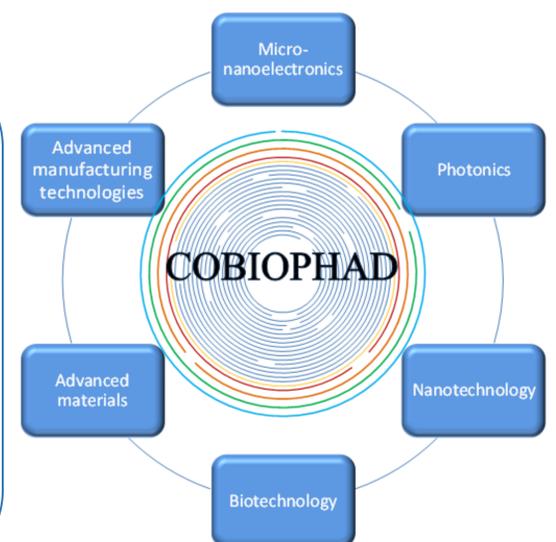
According to the European Network for Drug Allergy (ENDA), in vivo skin tests (prick and intradermal) and drug provocation tests are the gold standard methods in the detection of immediate BLCs allergy. However, although specificity (98-100%) is good, these tests are invasive, expensive and lack sensitivity (61-70%). Indeed, the high rate of false diagnosis has critical consequences, resulting in prolonged hospitalization and increased risk of mortality¹. In daily practice, few in vitro diagnostic methods are available and only used at the tertiary health services. The use of in vitro diagnostic tests (IVD) for the detection of specific IgEs associated to BLC hypersensitivity is a highly demanded solution to substitute the invasive and risky in vivo tests (gold reference). The current IVD, developed with bulky autoanalyzers and based on classical technologies, show low sensitivity (lower than 40%; detection limits $>0.2\text{kU/L}$)², analyze only 5 BLCs and give false positive and negative results. The problems with existing tests are compounded by the fact that the costs of drug allergy diagnosis are high. The estimated amount is between 375 € and 525 € per studied drug. Besides this, erroneous allergy diagnosis causes additional costs, due to the critical patient condition and need for prolonged hospitalization.



OBJECTIVE

The main objective of COBIOPHAD is the development of an innovative in vitro diagnostic (IVD) device for diagnosis of IgE-mediated drug allergies to β -lactams antibiotics by building an integrated biophotonic system based on compact disc technology. Mass consumer electronic technologies offer huge advantages to serve as basis of health devices. Between them, compact disc incorporates a potential analytical platform (disc) and a detector (disc player) with competitive performances and costs. Proofs demonstrating the viability of this concept have been shown.³

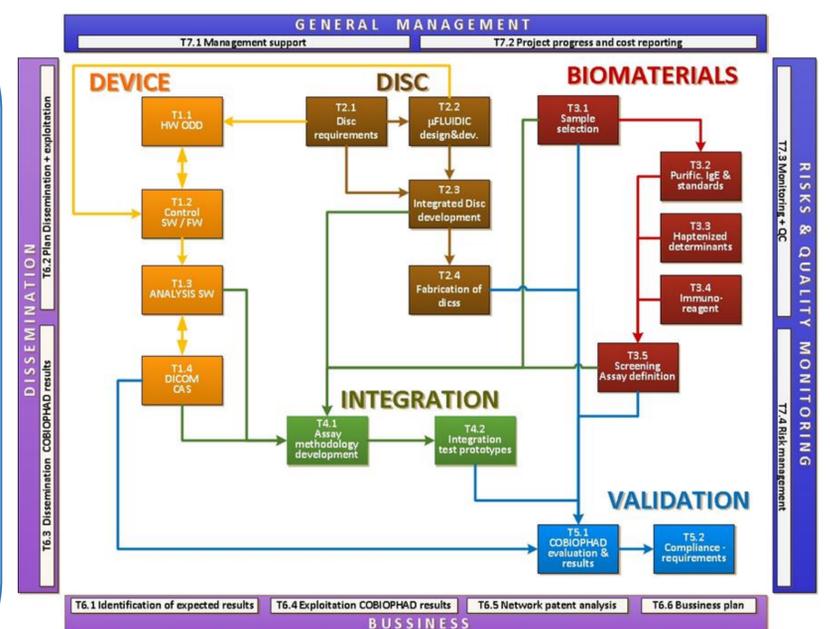
Key enabling technologies, including photonics, use of advanced materials, opto-electronics, and bio-analytical tools, will be integrated to develop the CONIOPHAD device.



THE COBIOPHAD SOLUTION

The COBIOPHAD device will be characterized by the following specifications:

- Sensitivity (80%) and detection limit below 0.1 kU/L..
- High specificity ($\geq 98\%$) due to selective assays simultaneously determining responses of different BLCs.
- Multiplexing capability (high number of samples per disc and BLCs per sample), rapid (30 minutes maximum total analysis time) in vitro diagnosis of the main allergenic BLCs.
- Low-cost device with a manufacturing price of 300 € for the detector, 1 € per disc and 0.3 €/allergen in reagents.
- High scalability covering a broad range of scenarios, i.e. from 1-2 samples per disc for Emergency and Critical care units to 10 samples per disc recommended in Allergy Departments.
- Robustness of operation in point-of-care settings, achieved by combining centrifugal disc and detection drive.
- Operational autonomy: Due to the compact format, the device can be fully autonomously operated in clinical or mobile lab environment and does not require any additional medical equipment.
- Reliable, validated in an operational environment and pre-industrial certified.



CONSORTIUM

The consortium comprises multidisciplinary knowledge on optics, electronics, advanced materials, biotechnology, smart microstructures, microfluidics, surface/organic chemistry, allergy, manufacturing systems, and telecom networking. Also, the key industrial actors, present in the consortium, will contribute to the manufacturing and placing the product on the IVD market.

Acknowledgements

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Referencias

1. Pawankar R, Canonica GW, ST Holgate ST, Lockey RF, Blaiss M. The WAO White Book on Allergy (Update. 2013)
2. Rubio M, Bousquet P-J, Demoly P. Update in drug allergy: novel drugs with novel reaction patterns. Curr Opin Allergy Clin Immunol. 2010;10(5):457-462.
3. Morais S, Tortajada-Genaro L, Maquieira A. Array-on-a-disk? How Blu-ray technology can be applied to molecular diagnostics. Expert Rev. Mol. Diagn. 2014; 14(7), 773-775