Bar-Ilan University
אוניברסיטת בר-אילן

RESEARCHER PROFILE

Prof. Amos Danielli

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HORIZON EUROPE TOPIC(S) OF INTEREST:

1. ***HORIZON-HLTH-2023-TOOL-05-08: Pandemic preparedness and response: In vitro diagnostic devices to tackle cross-border health threats***
2. ***HORIZON-HLTH-2024-DISEASE-08-12: Pandemic preparedness and response: Maintaining the European partnership for pandemic preparedness***
3. ***HORIZON-HLTH-2024-DISEASE-03-13-two-stage: Validation of fluid-derived biomarkers for the prediction and prevention of brain disorders***
4. ***HORIZON-HLTH-2024-DISEASE-03-11-two-stage: Pandemic preparedness and response: Adaptive platform trials for pandemic preparedness***
5. ***HORIZON-HLTH-2023-DISEASE-07-01: European Partnership on Rare Diseases***

CONTRIBUTIONS TOWARD CALL TOPIC

Our lab specializes in rapid and highly sensitive detection of biomarkers, including antibodies, proteins, and specific nucleic acid sequences (e.g., RNA or DNA sequences). We have developed a magnetic modulation biosensing technology that sophistically combines fluorescent and magnetic tagging of target molecules. By concentrating the magnetic beads to the laser beam and manipulating them from side to side, we increase the concentration of the fluorescently labeled target molecules and separate them from the constant background noise. We have demonstrated the analytical and clinical performance of the technology for rapid and highly sensitive serological assays (West Nile, Dengue, Zika, SARS-CoV-2), molecular assays (SARS-CoV-2), and other pathogens.

We have extensive experience in in vitro diagnostic technologies and detection of biomarkers in various fields. We currently have collaborations with the Israeli Central Virology Laboratory and several hospitals in Israel.

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BRIEF PROFILE

With my extensive background in optics, electrical engineering, and biosensing, I have focused my research on the development of technologies for *in vitro* diagnostics (IVD), specifically in resource-limited settings. When marking the target analyte with a fluorescent probe, at low concentrations, the fluorescence signal is very weak and surrounded with background noise. One of the main challenges in detecting low concentrations of fluorescently labelled biomarkers is separating the fluorescence signal from other red shifted photons, such as Raman scattering of the solvent, residual fluorescence from unbound fluorescent molecules, or autofluorescence of the capture surface. In my lab, we invented several technologies that overcome this challenge. In general, the work in my lab is multidisciplinary in its natures and it covers several aspects:

1. **IVD tools development** - Magnetic modulation biosensing (MMB), magnetically aggregated biosensors (MAB), optical modulation biosensing (OMB), high-throughput OMB (ht-OMB), photobleaching to improve the sensitivity of fluorescence-based immunoassays
2. **Immunoassays and serology** – SARS-CoV-2, Zika virus, interleukin-8
3. **Molecular-based assays** – Chick sexing, cancer biomarkers, SARS-CoV-2
4. **Basic research** – Detection of protein-protein interactions, detection of protein-DNA interactions, inhibitor screening

The work in the lab has led to several patent applications and grants that were awarded by different funding sources, including the Israel Science Foundation (ISF), Bi-national Science Foundation (BSF), Ministry of Science and Technology (MOST), and the Israel Innovation Authority. In addition, based on the saliva-based molecular assay that was developed in the lab, the Israeli Ministry of Health initiated, in October 2021, the first and only test run in Israel for the validation of extraction-less saliva-based PCR tests (https://www.gov.il/en/departments/news/07102021-03).

RELEVANT PUBLICATIONS

1. S. Burg, S. Roth, M. Cohen, S. Avivi-Mintz, M. Margulis, H. Rohana, A. Peretz, and **A. Danielli**, “High throughput optical modulation biosensing for highly sensitive and rapid detection of biomarkers”, Talanta, 248, 123624 (2022)
2. S Avivi-Mintz, Y. Lustig, R. Koren, S. Katz-Likvornik, E. Schwartz, and **A. Danielli**, “Highly sensitive and specific SARS-CoV-2 serological assay using a magnetic modulation biosensing system”, *Biosensors*, **12,** 7 (2021)
3. S. Roth and **A. Danielli**, “Rapid and sensitive inhibitor screening using magnetically modulated biosensors”, *Sensors*, **21,** 4814 (2021)
4. S. Roth, Y. Zander, Y. Michelson, E. Banin, and **A. Danielli**, “Identification of protein-protein interactions using a magnetic modulation biosensing system”, *Sensors and Actuators B: Chemical*, **303,** 127228 (2020)
5. Y. Michelson, Y. Lustig, S. Avivi, E. Schwartz, and **A. Danielli**, “Highly sensitive and specific Zika virus serological assays using a magnetic modulation biosensing system”, *Journal of Infectious Diseases*, jiy606 (2018)

BAR ILAN UNIVERSITY PROFILE

Established in 1955, Bar Ilan University (BIU) is currently one of Israel's largest universities with a total undergraduate and graduate student enrollment of 19,000. With more than 1,600 senior and junior faculty members, BIU has achieved an international reputation for academic and research excellence, especially, but not limited to the fields of artificial intelligence, renewable energy, bio-medicine, brain sciences, cancer, cyber security, cognitive sciences, environment, quantum technologies, medicine, archaeology, nanotechnology and advanced materials.

Building on our past and current successes in FP6, FP7, H2020 and ERC projects, BIU is committed to strengthening its research and innovation infrastructure and supporting multidisciplinary innovative research initiatives with its 55 research centers and 60 endowed chairs. In addition, both the Bar Ilan Center for Smart Cities and Bar Ilan's Institute of Nanotechnology and Advanced Materials (BINA) are recognized by the EU SMART SPECIALISATION PLATFORM as Digital Innovation Hubs.