

The Interdisciplinary Center for Metabolomics and Natural Products

Small Molecules — Big Impact

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Small Molecules have a **Big Impact** on human life. In nature, they help organisms communicate, defend themselves, adapt, and survive. For society, they can become the foundation for new medicines, sustainable agriculture, biotechnology, food innovation, and environmental solutions. Long before modern laboratories, many of humanity's most important medicines originated in nature. Penicillin was discovered in a mold. Aspirin traces its roots to willow bark. Yet scientists have identified only a small fraction of the compounds produced by living organisms. Some are hidden in the ocean, others in desert soils or extreme environments, and many exist within the human body itself, still waiting to be discovered.

Metabolomics—the study of these small molecules—gives scientists the tools to find them. By identifying and analyzing the chemical compounds that organisms produce, researchers can tap into nature's vast chemical repertoire and explore new possibilities in medicine, biotechnology, agriculture, food production, and environmental sustainability.

The **Interdisciplinary Center for Metabolomics and Natural Products** was established to help researchers at the University of Haifa and across Israel explore this largely uncharted territory. As one of the country's few facilities capable of analyzing small molecules across gas, liquid, and solid phases, the Center provides advanced instrumentation and specialized expertise that many researchers could not otherwise access. Its work is helping scientists identify novel pharmaceuticals, health-associated biomarkers, and bioactive compounds while training the next generation of scientists in the interdisciplinary methods needed to advance research in biology, chemistry, and data science.



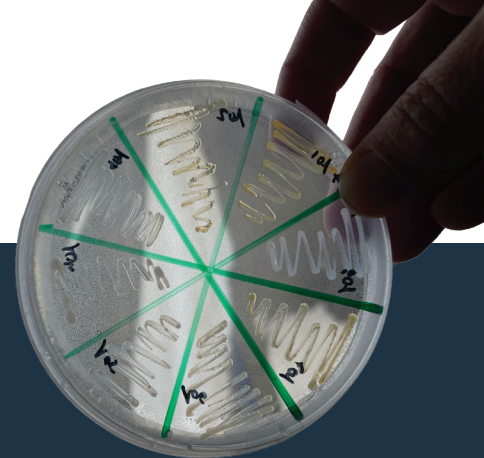
Overview

Established in 2024 with founding support from Israel's Council for Higher Education, the Center has quickly built a strong reputation for its collaborative approach to scientific investigation. Its advanced instrumentation can detect compounds present in extraordinarily low concentrations, including many that conventional systems fail to identify. This capability enables researchers to better understand biological processes and isolate promising molecules for further investigation. In less than two years, more than a dozen researchers and ten companies and institutes have turned to the Center for collaborations, services, analytical capabilities, and scientific expertise available at only a handful of facilities in Israel.

Researchers working in fields as diverse as cancer biology, marine science, agriculture, archaeology, and environmental science now bring their samples to Haifa rather than sending them abroad. The result is faster access to data and a stronger research ecosystem in Israel, enabling researchers across disciplines to collaborate and advance new discoveries.

The Center's impact extends well beyond the University. Academic laboratories, biotech companies, startups, and industry partners rely on its expertise to answer scientific questions that would otherwise be difficult, costly, or impossible to pursue. Graduate students work alongside these researchers, gaining practical experience through active research projects and training in advanced analytical techniques.

Current projects demonstrate how the Center's capabilities are being applied across disciplines:



- **Cancer research, Advancing the Fight Against Metastasis.** Nearly one-third of women treated for invasive breast cancer face the threat of metastatic relapse. Dr. Dalit Barkan's laboratory at the University of Haifa is working to prevent dormant tumor cells from reactivating and spreading. Using the Center's specialized equipment, researchers isolated a critical compound needed to advance this work, overcoming a technical challenge that other facilities in Israel had been unable to solve.
- **Agricultural waste, reimagined.** Every year, large quantities of agricultural byproducts are discarded despite containing plant proteins and healthy nutrients. Through its partnership with the Side2Dairy consortium, the Center is training students to safely transform agricultural side-streams—including potato leaves, wheat stalks, and olive pomace—into alternative dairy products, natural thickeners, and health-boosting antioxidants.
- **Marine discovery, accelerated.** The ocean contains an enormous diversity of chemical compounds that remain largely unexplored. Based at the University of Haifa—ranked #1 in marine sciences in Israel—the Center is helping Israeli algae startups identify and extract high-value ingredients for pharmaceuticals, foods, and natural personal care products.





Academic Leadership

The Center is led by Dr. Tal Luzzatto Knaan, an analytical biochemist and scientific diver specializing in marine natural products and metabolomics. She earned her MSc in Biotechnology and PhD in Biochemistry, Food Science, and Nutrition from the Hebrew University of Jerusalem, followed by a Vaadia-BARD postdoctoral fellowship at the Skaggs School of Pharmacy and Pharmaceutical Sciences at UC San Diego and a second fellowship in Marine Biology at the University of Haifa. Her research takes her to extreme environments—including Antarctica, the Dead Sea, and the deep sea—to study the chemical diversity of algae and microorganisms and uncover previously unknown compounds.

A resident of northern Israel, Dr. Luzzatto Knaan served as a Lieutenant in the Air Defense reserves and is committed to advancing opportunities for women in science.

Meeting Growing Demand

The Center's infrastructure is established, researchers are generating new discoveries, and demand for its capabilities continues to grow.

The Center's next stage of growth will focus on expanding its analytical capabilities through advanced instrumentation, strengthening scientific expertise, developing new methodologies, and increasing training opportunities for students.

Located in northern Israel, the University of Haifa plays an important role in the region's recovery and future growth. Expanding the Center's capabilities will strengthen Israel's scientific capacity while supporting continued growth in research and innovation across northern Israel.

We invite partners who share our commitment to advancing scientific discovery in Israel to help ensure that more researchers, students, and industry collaborators can benefit from the Center's expertise and technology.