

# ADVANCED BIODESIGN

## Category:

Best Startup

## Company Name:

ADVANCED BIODESIGN

## Turnover and/or Funding:

PRODUCT/ SERVICE

Company Name : ADVANCED BIODESIGN

Number of employees : 16

Turnover and/or Fundings : 25M€ since 2013 (Equity) and 5M€ (Public Funding)

Therapeutic Area(s) : Oncology

## Sub-Category:

Biotechnology

## **Corporate history (creation, key milestones, main funding,...)Information on Condition / Disease and need for solution / product (prevalence, existing treatments / solutions):**

Founded in 2010 in Lyon, France, Advanced BioDesign is a privately owned clinical-stage biotechnology company committed to transforming cancer treatment by addressing one of oncology's most critical challenges: drug resistance. The company's origins trace back to over two decades of academic research on the enzymatic role of aldehyde dehydrogenases (ALDHs), initiated by Professor Gérard Quash at INSERM Lyon in the 1980s. This foundational research led to the identification of ALDH inhibition as a promising strategy to induce cancer cell death. Between 2010 and 2013, Advanced BioDesign successfully demonstrated in vitro proof of concept and secured early-stage investment from Xerys Invest in 2013. A major milestone was reached in 2014 with the acquisition of key patents related to ALDH inhibition, laying the groundwork for a robust intellectual property portfolio that now includes 11 patent families, protecting innovations until at least 2040 and valued at over €120 million.

The medical need addressed by Advanced BioDesign is both urgent and widespread. Cancer remains a leading cause of death globally, with 10 million deaths annually. Despite advances in treatment, 20-50% of patients relapse after conventional therapies, and up to 50% of those with advanced cancers exhibit resistance to standard

treatments. This resistance significantly limits therapeutic options and worsens patient outcomes. In AML alone, 30% of patients are resistant to first-line treatments, and 50% relapse within a year, with a median survival of less than 12 months for these patients. Current therapies, including chemotherapy, immunotherapy, and targeted treatments, often fail to address the underlying mechanisms of resistance, leaving a substantial gap in care.

Over the years, the company has invested more than €30 million in preclinical and clinical development, culminating in the launch of its first-in-human clinical trial, ODYSSEY, in 2022. This trial evaluates ABD-3001, a first-in-class ALDH1 inhibitor, in patients with Acute Myeloid Leukemia (AML), a cancer with high relapse rates and limited treatment options. The trial has already demonstrated encouraging results: in the Single Ascending Dose phase, 100% of doses showed biological activity, with 50% of patients maintaining this activity up to seven days post-treatment. Importantly, only one dose-limiting toxicity was observed at the highest dose level. In the ongoing Multiple Dose phase, no severe toxicity has been reported to date, and 50% of patients have shown a hematological response, including one patient achieving complete remission after just one month of treatment. These early clinical outcomes highlight the potential of ALDH1 inhibition to offer a safe and effective alternative for patients with resistant or relapsed AML.

Advanced BioDesign's approach is unique in that it targets ALDH1, an enzyme reactivated in cancer cells that plays a central role in detoxifying harmful aldehydes and supporting cell survival under therapeutic stress. By inhibiting ALDH1, ABD-3001 disrupts cancer cell metabolism and induces apoptosis without harming healthy cells. This mechanism is not mutation-specific, making it applicable across a broad range of cancers. The company is also advancing ABD-3171, a second-generation ALDH1 inhibitor, for use in solid tumors such as lung and breast cancer, with promising preclinical results.

## **History of the development of the solution/product (Intellectual Property, preclinical and clinical datas, development collaborations):**

The development of Advanced BioDesign's therapeutic platform is the result of over two decades of research into the role of ALDH1 enzymes in cancer resistance. This work led to the creation of two innovative drug candidates: DIMATE (also known as ABD-3001) and ABD0171. These compounds are designed to block specific ALDH1 isoforms that help cancer cells survive treatment and resist chemotherapy. DIMATE primarily targets ALDH1A1 and ALDH1A2, which are overexpressed in blood cancers like acute myeloid leukemia (AML), while ABD0171 is optimized for ALDH1A3, more prevalent in aggressive solid tumors such as triple-negative breast cancer and lung cancer.

DIMATE, originally synthesized in 2002, was fully characterized by Advanced BioDesign and shown to be a covalent, irreversible inhibitor with high selectivity for ALDH1 isoforms over ALDH2 and ALDH3A1. Its biochemical profile confirms potent inhibition of ALDH1A2 and ALDH1A3, with minimal off-target effects. DIMATE has shown strong preclinical efficacy in both laboratory and animal models. It selectively kills cancer cells by disrupting their ability to manage oxidative stress, triggering a cascade of stress responses that lead to cell death. Importantly, DIMATE spares healthy cells, including normal hematopoietic stem cells, and has demonstrated a favorable safety profile in early toxicology studies. In combination with standard treatments like hypomethylating agents (e.g., azacytidine), DIMATE has shown synergistic effects, even in cells from patients who had relapsed after previous therapies.

These promising results laid the foundation for the ODYSSEY clinical trial, a first-in-human Phase 1 study launched in 2022 to evaluate DIMATE in patients with relapsed or refractory AML. The trial has already yielded encouraging outcomes: all tested doses showed biological activity, and half of the patients in the multiple-dose phase experienced hematological responses, including one complete remission. These early clinical signals confirm the therapeutic potential observed in preclinical models and support further development.

The success of this program is also the result of strong academic and industrial collaborations. Advanced BioDesign has partnered with leading research institutions such as the University of Barcelona (UAB), the Luxembourg Institute of Health (LIH), the Institut of Molecular Genetic (IMG), the TAGC (Technologie Avancée pour le Génome et la Cellule), and the French Alternative Energies Center (CEA). These collaborations have been instrumental in elucidating the molecular mechanisms of ALDH1 inhibition and identifying biomarkers of response.

On the industrial side, Advanced BioDesign has built a robust network of specialized partners to support drug development and manufacturing: Roowin and GTP Bioways have contributed to the synthesis and formulation of the drug substances, ICTA provides clinical trial management expertise, and VCLS (Voisin Consulting Life Sciences) supports regulatory strategy and interactions with health authorities.

Together, these efforts have enabled the transition from academic discovery to clinical application, with a well-protected intellectual property portfolio (11 patent families valid through 2040) and a clear path toward market access. With DIMATE already in clinical trials and ABD0171 advancing through preclinical development, Advanced BioDesign is well-positioned to deliver a new class of cancer therapies that address one of the most urgent challenges in oncology: treatment resistance.

**Why this drug or device is innovative, the broad implications for future research, and/or how it will improve the human condition:**

Advanced BioDesign's therapeutic approach represents a major innovation in oncology by addressing one of the most persistent and devastating challenges in cancer treatment: therapeutic resistance. While most current therapies target specific mutations or immune checkpoints, Advanced BioDesign has developed a universal, mechanism-based strategy that targets a fundamental metabolic vulnerability shared across many cancer types. At the heart of this innovation is the inhibition of ALDH1 enzymes—key players in cancer cell detoxification, survival, and resistance to chemotherapy.

DIMATE (ABD-3001), the company's lead compound, is a first-in-class, covalent, and irreversible inhibitor of ALDH1 isoforms, with high selectivity for ALDH1A1 and ALDH1A2. This selectivity allows it to disrupt cancer cell metabolism without harming healthy tissues. Unlike traditional chemotherapies that indiscriminately attack dividing cells, DIMATE induces cancer cell death by triggering oxidative, genotoxic, and endoplasmic reticulum stress, exploiting the cancer cell's own metabolic fragility. This mechanism is particularly effective in leukemic stem cells, which are often resistant to standard treatments and responsible for relapse. The innovation lies not only in the target but in the way DIMATE reshapes the intracellular environment to make cancer cells vulnerable again.

The implications of this approach are broad and transformative. By targeting a resistance mechanism common to many cancers, ALDH1 inhibitors offer a scalable solution that can be applied across hematological malignancies and solid tumors. ABD0171, the company second lead, is optimized for ALDH1A3 and shows strong potential in triple-negative breast cancer and lung cancer. Moreover, ALDH1 inhibitors have demonstrated synergy with existing therapies, including hypomethylating agents and immune checkpoint inhibitors, opening the door to combination regimens that could redefine treatment standards.

Advanced BioDesign's therapeutic approach is also profoundly innovative because it targets the root cause of cancer relapse and treatment failure: cancer stem cells. These rare but resilient cells are capable of self-renewal, are highly resistant to conventional therapies, and are widely recognized as the origin of disease recurrence. Overexpression of ALDH1 enzymes is a defining biomarker of these cancer stem cells. By focusing on this metabolic shield of cancer stem cells, Advanced BioDesign has developed a strategy that goes beyond symptom control to address the biological origin of cancer persistence.

The broader implications for future research are substantial. ALDH1 inhibition represents a platform technology that can be applied across multiple cancer types, and ALDH1 expression could also serve as a predictive biomarker, guiding treatment decisions and enabling real-time monitoring of resistance development. This opens the door to a new era of precision oncology, where therapies are tailored not only to genetic mutations but to functional vulnerabilities of the tumor.

Ultimately, the innovation brought by Advanced BioDesign is not just scientific—it is human. By directly targeting the cells and mechanisms responsible for relapse and resistance, this approach has the potential to extend survival, reduce suffering, and restore hope for patients and families affected by aggressive cancers. It represents a shift from managing disease to disrupting its very foundation, paving the way for a future where cancer resistance is no longer an obstacle to effective care.

**Please provide appropriate references (PubMed, Abstract, Website):**

[www.a-biodesign.com](http://www.a-biodesign.com)

<https://www.linkedin.com/company/advanced-biodesign/>

<https://www.youtube.com/@advancedbiodesign3217>

**Publications**

- Benajiba et al., 2024 <https://doi.org/10.1182/blood-2024-204998>
- Pequerul et al., 2024 <https://doi.org/10.1101/2024.10.18.619128>
- Venton et al., 2024 <https://doi.org/10.1111/jcmm.70011>
- Jiménez et al., 2024 <https://doi.org/10.3390/ijms252111512>
- Pérez-Alea et al.; 2017 <https://doi.org/10.1038/onc.2017.160>
- Venton et al.; 2016 <https://doi.org/10.1038/bcj.2016.78>

**References File Document upload:**

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