

# Bio Explorer

biologyAI team

# Problem and Solution

How to cure cancer?

Many different approaches and platforms

New synthetic biology platforms are very promising

Vast amount of information about biology in journals

How to find new promising approaches

and build therapies around them

# Our product : Bio Explorer for Cancer

OpenAI GPT Chatbot

Designed to answer questions about biology

Specifically to look into novel cures for cancer

Uses scientific method + automation

Analyze companies developing these treatments

# Bio Explorer Flowchart

- 1) Search web for new treatments for cancer
- 2) Identify existing cancers that might be amenable
- 3) Make hypotheses about how to treat them
- 4) Design experiments for robots to test theories
- 5) Run experiment with robot (e.g. OpenTrons)
- 6) Examine results

# 1) Search web for new treatments for cancer

Prompt: Please explain the type of treatment tebentafusp uses, and are there any other cancer drugs that use a bispecific fusion antibody targeting T-cells and an antigen on the cancer cell

Response: Tebentafusp is a novel therapeutic agent used in cancer treatment, particularly for metastatic uveal melanoma. It represents a unique approach in cancer therapy, employing a bispecific fusion protein that targets both T-cells and an antigen on the cancer cell.

By binding to both T-cells and cancer cells, tebentafusp brings these cells into close proximity. This interaction activates the T-cells, prompting them to attack and destroy the cancer cells.

Tebentafusp is specifically designed for uveal melanoma because of the expression of gp100 in these cells. This specificity helps in targeting the therapy directly to the cancer cells, minimizing effects on healthy cells.

# 1) Similar treatments chat

ImmTACs (Immune-mobilizing Monoclonal T-cell Receptors Against Cancer): Although related to BiTEs, ImmTACs use a T-cell receptor instead of an antibody fragment to recognize proteins on cancer cells. This allows them to bind intracellular proteins that have been processed and presented externally. One such therapeutic, tebentafusp (Kimmtrak), has been approved to treat uveal melanoma.

GEN1047: An investigational ImmTAC targeting the B7H4 immune checkpoint protein on cancer cells, showing promising preclinical activity in ovarian cancer models and has entered clinical testing.

IMA402: Targets the PRAME protein and has demonstrated clinical activity against several solid tumor types, including lung, ovarian, uterine, skin, and synovial cancers.

# GEN1047

Prompt: Tell me all about GEN1047

Response: GEN1047 is a novel bispecific antibody currently under investigation for its potential in treating solid tumors. Here are the key details about GEN1047:

**Mechanism of Action:** GEN1047 is designed to target both CD3, a component of the T-cell receptor complex on T-cells, and VTCN1 (B7H4), a protein often expressed on the surface of tumor cells. This dual targeting mechanism is intended to bring T-cells and cancer cells into close proximity, thereby promoting the activation of T-cells to attack and destroy the cancer cells.

**Clinical Trials:** GEN1047 is currently being evaluated in clinical trials. The trial, identified as NCT05180474, is a Phase Ib/II study focusing on the use of GEN1047 in solid tumors. This is the first study of GEN1047 in humans.

# GEN1047 company

Prompt : Who is developing it?

Response: GEN1047 is being developed by Genmab, a biotechnology company specialized in creating and developing antibody therapeutics for the treatment of cancer. Genmab is known for its focus on innovative cancer therapies and has been involved in the development of several notable cancer drugs. The development of GEN1047, as with many of their therapies, reflects their commitment to advancing cancer treatment through novel immunotherapeutic approaches.



# IMA402

Prompt: Tell me all about IMA402

IMA402 is a promising drug candidate under development for the treatment of advanced solid tumors. Here are the key details about IMA402:

**Therapeutic Approach:** IMA402 is designed as a bispecific T cell engaging receptor (TCER®) molecule. TCER® molecules are off-the-shelf biologics that leverage the immune system by redirecting and activating T cells towards cancer cells expressing specific tumor targets. They enable any T cell in the body to become activated and attack the tumor, regardless of the T cells' intrinsic specificity.

**Targeting PRAME:** IMA402 targets a peptide derived from PRAME (preferentially expressed antigen in melanoma), a clinically established cancer target frequently expressed in a variety of solid tumors. This targeting approach supports the program's potential to address a broad cancer patient population.

# IMA402 company

Prompt : Who is developing IMA402? Are they a public company?

Response: IMA402 is being developed by Immatics N.V., a clinical-stage biopharmaceutical company. Immatics is active in the discovery and development of T cell-redirecting cancer immunotherapies, with a focus on innovative treatments for patients with advanced solid tumors. Yes, Immatics N.V. is a public company; it is listed on NASDAQ under the ticker symbol IMTX. This listing reflects the company's status as a publicly traded entity, allowing investors to buy and sell shares in the company on the stock market.

# Market Analysis

Bispecific fusion proteins could theoretically be applicable to almost all types of cancers, provided that specific and unique antigens on the cancer cells can be identified and targeted.

The market potential for these therapies is significant, given their applicability across a range of cancers. Their success could revolutionize cancer treatment, offering more effective and targeted therapies with potentially fewer side effects compared to traditional treatments.

In summary, while the theoretical applicability of bispecific fusion proteins is vast, practical implementation requires overcoming significant scientific and clinical challenges, especially in identifying and targeting specific antigens in different cancer types. The market potential is vast, but it hinges on ongoing research and development efforts.

## 2) Identify existing cancers that might be amenable

One cancer that is notoriously difficult to treat but presents a targetable antigen is pancreatic cancer, specifically pancreatic ductal adenocarcinoma (PDAC). PDAC is challenging to treat due to its late diagnosis, aggressive nature, and resistance to conventional therapies.

A notable target on the surface of pancreatic cancer cells is the antigen called MUC1 (Mucin 1). MUC1 is a membrane-bound protein that is overexpressed and aberrantly glycosylated in pancreatic cancer cells. This abnormal expression and glycosylation pattern make it distinct from MUC1 found in normal tissues, which provides a specific target for therapy.

### 3) Make hypotheses about how to treat them

Hypothesis: A bispecific fusion protein, analogous to Tebentafusp but modified to target MUC1 on PDAC cells and CD3 on T cells, could effectively mediate the destruction of PDAC cells. This protein would bind to MUC1 on the surface of PDAC cells with one arm and to the CD3 receptor on T cells with the other arm, forming a bridge that brings the T cells into direct contact with the cancer cells, thereby triggering a targeted immune response against the tumor.

## 4) Design Experiment

Experiment Design: Testing the Binding Efficacy of a Bispecific Antibody Targeting MUC1 Using an Opentrons Robot

Objective: To evaluate the binding efficacy of a bispecific antibody that targets MUC1 on the surface of pancreatic cancer cells using an automated Opentrons robotic system.

Materials: Opentrons robotic liquid handling system. Cell lines: PDAC cell line expressing MUC1 and a control cell line without MUC1 expression. Bispecific antibody targeting MUC1 and CD3. Fluorescently labeled secondary antibody specific to the bispecific antibody. Cell culture media, plates, and standard cell culture supplies. Flow cytometer for analyzing cell-bound fluorescence. Reagents for cell fixation and permeabilization (if intracellular staining is required). Assay buffers: PBS, blocking buffer, washing buffer.

## 5) Run experiment

Cell Culture: Grow PDAC and control cells to desired confluency.

Antibody Incubation: Dispense bispecific antibody (various concentrations) to cells using Opentrons.

Washing and Secondary Antibody: Wash cells; add fluorescent secondary antibody.

Final Wash and Preparation: Perform final wash; fix/permeabilize for flow cytometry.

Flow Cytometry Analysis: Measure fluorescence to assess binding.

Data Analysis: Quantify binding efficacy; compare fluorescence intensities across concentrations.

Expected Outcomes: Higher binding of bispecific antibody to MUC1-expressing PDAC cells vs. control cells; dose-response relationship.

## 6) Analyze experiment

Data Interpretation: Processes dataset to identify key patterns.

Predictive Analysis: Forecast outcomes and binding behaviors.

Visualization & Modeling: Generates molecular interaction models and visual representations.

Comparative Analysis: Compares results with extensive antibody interaction databases.



# Market Analysis: AI in Oncology

TAM: Global Oncology Drugs Market

- 2022 Value: USD 184.95 Billion
- Projected 2030 Value: USD 484.32 Billion
- Includes all cancer R&D activities globally.

SAM: AI in Oncology

- 2023 Value: USD 1.20 Billion
- Expected Growth: 33.5% CAGR (2024-2030)
- Focused on AI for cancer research, diagnostics, and treatment.

# Potential Revenue Streams in AI for Oncology

AI platforms for drug discovery and development.

Data Management & Analytics

Cancer data storage and analysis services.

Patient data management systems.

Partnerships with pharma and biotech companies.

Licensing AI algorithms and technologies to research institutions

# Key Competitors in AI for Oncology

BenchSci : Specializes in AI-driven literature analysis for antibody discovery and research.

IBM Watson Health : Offers AI solutions for data-driven clinical decision support.

Flatiron Health : Provides cancer-focused electronic health records and data analysis.

Tempus : Delivers precision medicine solutions through AI-powered data analytics.

DeepMind Technologies (Google Health) : Involved in various healthcare AI projects, including cancer-related research.

# Generative LLM model for cancer research

- \*\*Comprehensive Literature Review\*\***: Utilize LLM to analyze and summarize existing research papers, extracting key information on cancer antigens.
- \*\*Identifying Connections\*\***: LLM models can detect hidden correlations between different studies, revealing potential antigen targets.
- \*\*Update Alerts\*\***: Set up LLM to provide updates on new research findings in specific cancer types and antigen discovery.
- \*\*Data Synthesis\*\***: LLM integrates diverse data sets (genomic, clinical trials, etc.) for comprehensive antigen profiles.
- \*\*Hypothesis Generation\*\***: LLM suggests new hypotheses based on existing literature for exploring undiscovered antigens.