Optimer Biotech/Optimally engineered biopolymers

Industry
Biotech

Key Features
Optimer is developing a general biopolymer engineering platform for applications in drug discovery and diagnostics

Financing Sought, Funding Strategy and Use of Proceeds: Available upon request

Total External Capital Invested
50k pilot grant from the Columbia TRx accelerator.

Scientific Advisors
Harmen Bussemaker, Ph.D.
Professor and Chair, Dept. of Biological Sciences; Professor, Dept. of Systems Biology

Neel Shah, Ph.D.
Assistant Professor
Department of Chemistry

Company Lead Contact
Chaitanya Rastogi, Ph.D.
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Business/Technology Description: Optimer is building a platform to engineer biologic drugs to reduce the time, cost and risk of drug discovery. Despite their superiority, it's expensive to develop biologics (6-10 years/>$2B) given the difficulty in optimizing their performance on different parameters: on-target activity, toxicity, cross reactivity, etc. Researchers currently use trial-and-error approaches to sequentially improve these properties, but the antagonistic relationship between them makes optimizing challenging or even impossible. Additionally, high failure rates are driven by the fact that researchers are left in the dark about the outcome until the end of the iterative process. Optimer aims to turn this sequential, iterative process into a single-shot parallel one using a combination of physics-based machine learning and next-generation sequencing (NGS) assays to reliably discover safe and effective biologics.

Technology: Unlike other approaches, Optimer uses machine learning to accurately characterize properties for billions or more molecules, enabling us to comprehensively search "sequence space" and identify the best possible protein(s). Our modeling philosophy, honed over 20+ years of research, has culminated in our latest groundbreaking paper (in revision at Nature Biotech) which shows accurate measurement of enzymatic and binding properties from NGS data. Our approach is very general: it can be applied to different scaffolds ranging from cyclic polypeptides to monoclonal antibodies (mAbs) and be used to simultaneously optimize a range of molecular attributes from plasma stability to binding affinity and cross-reactivity.

Market size and growth: Driven by their increased safety, efficacy, and versatility, biologics have witnessed an explosion in their sales (~$200B with 12% CAGR in 2020) and pharma interest in developing them (~$35B in R&D spend). While mAbs constitute most of the market, mAb/mAb-like proteins form the cornerstone of many cutting-edge and rapidly growing therapeutic modalities such as bispecifics, CAR-T cells, PROTACs, etc. Importantly, the market for biosimilars and biobetters - drugs that are similar to and/or improved versions of blockbusters - is becoming very competitive. Optimer's general platform allows for participation in most aspects of the biologics market.

Comparables: Many companies exist in this space with differing business models and technical offerings; established companies offering biologic drug discovery services include Peptidream, Adimab, and AbCellera. Startups and others that leverage AI/ML approaches to deliver optimized drugs include Schrödinger, ATUM, LabGenius (25M Series A), ProteinQure (4M Seed), and BigHat Biosciences (19M Series A).

Intelectual Property: A PCT covering the computational inference methods has been filed.

Scientific Expertise: Dr. Bussemaker is an internationally known leader in computational biology. His research group at Columbia University has pioneered many topics related to the DNA binding specificity of transcription factors and the structure and function of gene regulatory networks based on integrative analysis of functional genomics data of different types. Dr. Shah has expertise in protein chemistry and biochemistry. His research group at Columbia University uses a variety of chemical and biological approaches, including deep sequencing-based high-throughput biochemical assays, to probe the structures and functions of eukaryotic signaling enzymes. Dr. Rube is an expert in biophysically informed machine learning and genomics.

Awards/Recognition: Dr. Bussemaker was the recipient of a John Simon Guggenheim Foundation Fellowship, a Lenfest Distinguished Columbia Faculty Award, and a Royal Netherlands Academy of Sciences Visiting Professor Fellowship. Dr. Shah received a postdoctoral fellowship and the Damon Runyon-Dale F. Frey Award for Breakthrough Scientists from the Damon Runyon Cancer Research Foundation.