Insilico Medicine
insilico.com

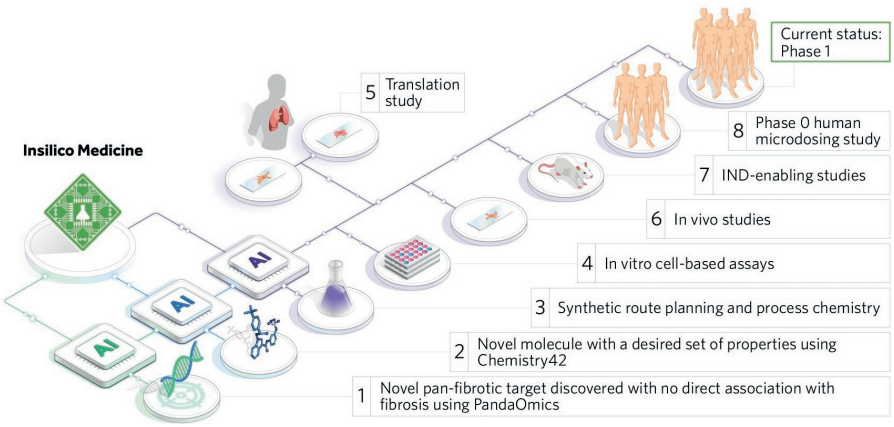
From target discovery to phase 1 initiation in under 30 months: AI-discovered and designed drug enters the clinic

With its unique PHARMA.AI platform, Insilico Medicine is transforming the world of drug discovery and development.

Deep learning in biopharma has come of age. After working for years to understand how to apply an artificial intelligence (AI) approach to biotechnology, Insilico Medicine recently announced the discovery of a novel drug target and novel molecule using AI. The total time from target discovery to the start of phase 1 took under 30 months and cost only a fraction of a conventional drug discovery program.

Insilico was founded in 2014 by a team of longtime academic researchers, Alex Zhavoronkov and Alex Aliper. At that time, deep learning systems had just begun to outperform humans in image recognition. The breakthroughs triggered a surge of interest in AI, but most projects focused on imaging, voice, and text. Training and validating deep neural networks to analyze those types of data took days and biology was far more challenging and time-consuming.

Insilico has documented how its AI, biology and chemistry experts rose to that challenge and established ways to apply deep learning to biotech through the publication of more than 150 peer-reviewed papers in academic journals and at top AI conferences. The work culminated in establishing interconnected deep learning models and advanced AI approaches capable of delivering a phase 1 clinical drug candidate in less than 30 months.



Linking biology and chemistry with AI.

Validating breakthrough AI platforms

Insilico validated the end-to-end discovery capabilities of its AI platform in a project designed to create a drug for the lung condition idiopathic pulmonary fibrosis (IPF). Building on an initial hypothesis, Insilico trained its deep neural network on omics and clinical datasets to predict tissue-specific fibrosis.

This work led to the use of Insilico's PandaOmics target discovery system to identify targets through deep feature selection, causality inference and de novo pathway reconstruction. Insilico used a natural language processing (NLP) engine to assess the targets' novelty and disease association via the analysis of data sources, including patents, research publications, and clinical trial databases. The process revealed 20 novel targets for validation that Insilico narrowed down to the most promising candidate.

Insilico then applied its generative chemistry platform for drug discovery, Chemistry42, to the chosen novel intracellular target. The platform uses generative and scoring engines to come up with hit compounds from scratch. All molecules created by Chemistry42 automatically have drug-like molecular structures and suitable physicochemical properties. The application of Chemistry42 to the novel target revealed by PandaOmics led to the generation of a library of small molecules.

Multiple molecules showed promising on-target inhibition, with one hit achieving nanomolar IC50 values without showing any sign of CYP inhibition. Optimization of that hit, named ISM001, improved solubility and resulted in good ADME properties. Subsequent studies found that these molecules improved fibrosis in a bleomycin-induced mouse lung fibrosis model and were safe when given to mice in a 14-day dose range-finding experiment.

After the positive preclinical studies, Insilico initiated the first-in-human study in healthy volunteers to establish dose and basic safety which was concluded successfully. This was followed by the initiation of a phase 1 clinical trial to test the same anti-fibrotic small molecule administered orally in healthy volunteers. Insilico is now rethinking human studies by applying AI to train clinical trial prediction and optimization engines further, and developing new AI concepts to support clinical development of the IPF drug candidate and beyond. Its ultimate goal is to develop effective and efficient medicines for patients.

Opening AI platforms to partners to create a healthy ecosystem

While Insilico continues the clinical development of its lead candidate, it also strives to digitize much of its R&D processes by actively seeking pharma partnerships via out-licensing, or establishing multi-year, multi-target strategic collaborations. Furthermore, biopharma companies can access Insilico's PandaOmics and Chemistry42 software tools to discover their own novel targets or drug molecules.

Insilico has shown that PandaOmics can identify novel molecular targets for various diseases, including IPF targets beyond the one it is pursuing. By pairing the target discovery power of PandaOmics to the generative chemistry capabilities of Chemistry42, Insilico stands to help its pharmaceutical partners transform drug discovery timelines and budgets.

The target and drug discovery platforms are just the beginning; Insilico has its global R&D centers staffed with the winners of AI competitions worldwide, giving it the expertise needed to empower innovation in drug discovery globally and digitize the entire R&D process.

With more than two dozen internal discovery and preclinical programs, Insilico intends to take at least two of these programs into human clinical trials inventing new ways to apply AI to improve both enrollment and monitoring of clinical trials. Combining its end-to-end PHARMA.AI platform with human intelligence and experience the company is a trailblazer in an exciting field that could potentially lead to a drug discovery breakthrough.

CONTACT
Alex Zhavoronkov, CEO
Insilico Medicine
New York, NY, USA
WeChat: biogerontology
Email: ai@insilico.com