

Operating System (OS): end-to-end AI-driven drug discovery and development

Category:

Best Digital Health Solution

Company Name:

Recursion

Number of employees:

201-500

Turnover and/or Funding:

N/A

Product/Solution Name:

Recursion Operating System (OS): end-to-end AI-driven drug discovery and development platform

Corporate Name:

Recursion Pharmaceuticals

Date of Approval:

2025-07-15

Indications:

Recursion's Operating System (OS) is a pioneering artificial intelligence (AI)-driven platform designed to industrialize drug discovery and development. Founded on the principle of leveraging cellular imaging and advanced machine learning, the Recursion OS addresses the historical 90% failure rate in traditional drug discovery by enabling the rapid evaluation of hundreds of potential programs. Instead of evaluating a few programs over years to find a \"hit,\" the Recursion OS, combined with its precision chemistry platform to identify hit candidates in weeks, at a fraction of the cost.

Today, the Recursion OS has yielded an advanced pipeline of potential first-in-class and best-in-class treatments for conditions with high unmet need, including aggressive cancers and rare diseases. To date, Recursion's pipeline has demonstrated acceleration

to clinical trials at a rate three times faster than industry average, and at half the cost.

A notable example of the Recursion OS's efficiency is Recursion's program for biomarker-enriched solid tumors and lymphoma (REC-1245), which targets RBM39 (a novel CDK12-adjacent target identified by the Recursion OS). This program progressed from target identification to IND-enabling studies in just 18 months, more than twice as fast as the industry average of 42 months. This demonstrates the Recursion OS's transformative impact on speed, efficiency, and cost reduction from hit identification to IND-enabling studies - showcasing a significant improvement in comparison to standard timelines.

Similarly, Recursion's program for advanced solid tumors (REC-617) - a potential first-in-class molecule - emerged from an exploration of new chemical space (a realm unlikely to be discovered by human designers) in under 12 months, and with only 136 novel compounds synthesized, showcasing rapid identification of this highly optimized molecule.

Note: UK-based biotech company Exscientia formally combined (merged) with Recursion in November 2024. Exscientia, a previous Prix Galien recipient, is now Recursion, further strengthening the combined entity's capabilities in AI-driven drug discovery.

Therapeutic Areas:

Since its founding in 2013, Recursion has been on a mission to decode biology and industrialize drug discovery to accelerate the development of new therapies for patients in need. Recursion has pioneered AI-enabled drug discovery and the TechBio sector, operating at the convergence of AI, chemistry, computation, biology, and physics.

The Recursion Operating System (OS) embodies a target-agnostic, data-driven approach by integrating vast layers of biological and chemical data with de-identified, real-world patient data.

The Recursion OS conducts up to 2.2 million experiments weekly, leveraging more than 65 petabytes of data to build digital "Maps" of biology. This massive dataset, combined with intelligent, proprietary machine learning algorithms, unlocks insights from trillions of biological and chemical relationships to elevate the most promising opportunities for validation.

Recursion is transforming drug discovery and development end-to-end through the Recursion Operating System, wielding expertise in biology to identify novel targets, expertise in chemistry for precision design, and insights from real-world patients to reach the right patients in clinical trials.

General Information File Document upload:

[Corporate Presentation_July 2025.pdf](#)

Background information and need for drug / device:

The pharmaceutical industry grapples with an alarmingly high failure rate: 90% of drugs fail in clinical trials, and development typically spans over a decade, costing an average of \$2 billion per drug.

This unsustainable model underscores a critical need for improvements in cost-efficiency and success rates. Recursion is fundamentally transforming this process using the Recursion Operating System (OS), which integrates AI, computer vision, purpose-built multimodal data, robotics, automation, and supercomputing to bring unprecedented speed and efficiency to drug discovery and development, end-to-end.

Unlike traditional drug discovery, which often begins with a specific target or hypothesis, Recursion leverages its platform to connect technical and scientific tools spanning physical experimentation to in silico analysis.

The interconnected foundation of Recursion's physical and digital labs creates a continuously learning and improving \"virtuous cycle\" feedback loop, driving more effective and accelerated drug discovery.

The Recursion OS replaces the traditional sequential and lengthy approach to drug development with an efficient, integrated, AI-first, patient-based learning system uniquely suited to address the complexities of drug discovery and meet urgent patient needs across various therapeutic areas, including rare diseases, neuroscience, and oncology.

Background File Document upload:

[ExscientiaPrix Galien 2024Background052024.pdf](#)

History of the development of the solution/product:

Recursion's approach is predicated on the fundamentally disruptive notion that integrated data and algorithms can discover and design more effective medicines faster and more affordably than traditional methods alone.

The development of the Recursion Operating System (OS) began more than a decade ago with the idea of using images of cells to train AI to understand the vast unknown biological space and the cellular disruptions driving disease.

Recursion's unique approach to drug discovery and development has attracted

industry-leading partners in both therapeutics and technology, including therapeutics partners Roche-Genentech, Bayer Pharmaceuticals, Sanofi and Merck KGaA, Darmstadt, Germany and technology partners including NVIDIA, GoogleCloud, Tempus, and Helix.

The Recursion Operating System (OS) is fueled by Recursion's on-premise supercomputer, Biohive-2, built in 2024, which is believed to be the most powerful supercomputer in biopharma.

In 2024, Recursion combined with UK-based biotech company Exscientia, further propelling the Recursion OS's capabilities in precision chemistry to drive the production of potential first-in-class and best-in-class medicines.

Development File Document upload:

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

Fundamental to Recursion's platform is a dramatic rethinking of "drug hunting" - how potential medicines are found, created, and tested before entering clinical trials. Recursion's Operating System (OS) is designed to fundamentally change the industry's underlying pharmacoeconomic model by improving the probability of success, time, and cost of creating new medicines. Our innovations are leading the industry by:

Pioneering "Maps of Biology" to Decipher Human Disease:

The Recursion OS is continuously building comprehensive digital "Maps of Biology," integrated proprietary data sets (now over 65 petabytes), to uncover novel insights into fundamental human biology and disease. These maps serve as an unbiased, data-driven foundation for target identification and drug discovery.

This "map-making" capability is exemplified by our groundbreaking partnerships. For instance, in collaboration with Roche-Genentech, Recursion delivered the world's first genome-scale Neuromap. This required building specific cell manufacturing technologies to derive over 1 trillion neuronal cells from human-induced pluripotent stem cells (hiPSCs), making Recursion a leading producer of neuronal iPSC cells. This dataset leverages unique neuronal data and proprietary algorithms to uncover novel insights into neurodegenerative diseases, leading to a \$30 million payment from Roche-Genentech for this first-of-its-kind neuroscience phenomap.

Similar data-driven insights are being delivered to partners like Bayer, where our platform accelerates the advancement of multiple fibrosis programs through highly integrated and fit-for-purpose datasets. This systematic approach to mapping biological relationships allows us to explore uncharted biological space and identify connections

previously inaccessible through traditional methods.

Building Towards a \"Virtual Cell\" for Accelerated and Cost-Effective Drug Development:

Recursion is actively pursuing the concept of a \"virtual cell,\" aiming to accurately simulate many biological processes in silico. This vision transforms drug discovery into a highly efficient search problem, where the vast landscape of potential drugs and disease mechanisms can be explored computationally before ever stepping into a wet lab.

By continuously training AI models with our massive proprietary datasets, including population-scale patient-level data, pathway-level data, and protein-level insights, we are building one of the most advanced predictive models of human biology ever created.

This transition towards simulated science will dramatically accelerate drug development timelines and significantly reduce costs by moving failure earlier in the process, ensuring only the most promising candidates advance to costly physical experimentation. It will also allow for the rapid iteration and optimization of drug candidates, ultimately increasing the probability of bringing more effective and safer medicines to patients faster.

Recursion is not only industrializing the drug discovery process but also reshaping the future of biopharma. By pioneering a new approach to medicine creation, we believe the best ideas of science can rapidly become the best medicines for patients, transforming healthcare and improving lives globally.

Innovation File Document upload:

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

www.recursion.com (www.recursion.com/pipeline and
www.recursion.com/scientificmaterials) and rxrx.ai

References File Document upload:

N/A