Category

Best Startup

Product/Solution Name

Emendo Biotherapeutics

Date of Approval

2015-12-06

Indications

Current pre-clinical pipeline with compound name and indication:

EMD-101: Severe Congenital Neutropenia

EMD-301: Familial Hypercholesterolemia

EMD-302: Hyperlipidemia

EMD-201: Retinitis Pigmentosa

EMD-202: Cone-Rod Dystrophy

EMD-203, Macular Dystrophy

Therapeutic Categories

Hematology, Cardiovascular, Ophthalmology

Background information and need for solution/product

EmendoBio was created to overcome a critical challenge in our approach to genetic disease and medicine. Well before the company's launch, David Baram, now the co-founder and CEO of the company, led a brainstorm. The group filled conference room whiteboards top-to-bottom with ideas and strategies to answer the question: How do we make CRISPR better?

As the conversation unfolded, the answer became clear: In order to make CRISPR better, it needed to be safer. A key issue with existing CRISPR technology is that many diseases do not fit into the standard CRISPR model. For example, to treat dominant disease indications, one allele needs to be edited while leaving the other one intact, which current CRISPR technology is not able to do. This lack of extreme precision also contributes to off-target effects resulting in unintended health conditions.

EmendoBio was formed with the foundational mission to take a different approach, working to optimize CRISPR-based editing and broaden our ability to treat all diseases safely.

By bringing together experts across the fields of computational biology, protein engineering, and RNA guide design, our team has worked to overcome the existing limitations of CRISPR-based genome

editing. We're able to specifically and effectively target any gene, and, most importantly, we're able to do so while eliminating off-target effects. In fact, our technology is so specific that we can cut one allele at a time, allowing us to target even the most difficult genetic indications, like autosomal dominant diseases.

History of the development of the solution/product

We have a growing pipeline tackling a variety of disease indications spanning cardiovascular, hematological, and ophthalmological disorders. Our custom drug compositions for familial hypercholesterolemia and hyperlipidemia are in the pre-clinical stages of development.

Both familial hypercholesterolemia and hyperlipidemia are genetic disorders that increase the risk of coronary heart disease, heart attack, and stroke. Both disorders are progressive yet have limited treatment options leaving patients with life-altering symptoms, driving a real need for genetic intervention.

Our lead indication for severe congenital neutropenia (SCN) is pending approval of its Investigational New Drug application ahead of entering clinical trials. As part of the approval process, we entered into a research collaboration with Seattle Children's Research Institute. The ongoing study investigates how hematopoietic stem cells (HSCs) extracted from patients with SCN respond to priming treatments ahead of administering a CRISPR-based therapeutic.

This study is laying the foundation for future clinical trials that could lead to potential therapies to treat the disease. Recent findings from our study have been published in Molecular Therapy - Methods & Clinical Development, an international journal that publishes important peer-reviewed methods and procedures in molecular therapy. We also share updates at industry events and conferences, such as the ASGCT and BIO conferences.

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

CRISPR-based genome editing was revolutionary upon its discovery; however, its approach using the wild-type form of the nuclease has its limitations, specifically regarding safety and precision. Recent years have brought forth a resurgence of innovation in gene editing, helping to refine existing CRISPR technology.

At EmendoBio, we are engineering precision into genetic medicine via our novel OMNI™ Technology Platform. The process increases genome accessibility to cover 86% of the genome, enabling scientists to broaden gene targeting. With more of the genome available, we're now able to treat a broader list of disease indications with highly effective editing and no off-target effects.

A major concern with CRISPR in its wild-type form is the relatively high rate of off-target effects, which have been viewed with a frequency of >50%. These off-target effects can lead to certain types of cancers among other unintended health conditions. The OMNI™ platform eliminates this risk, paving the way for safer gene therapies.

The foundation of our OMNI™ platform is a catalog of novel nucleases, which are critical to our precision. These nucleases are identified and then customized for specific disease indications using protein engineering, and computational and machine learning. With these custom nucleases, we are

then able to optimize the gene editing process for highly specific targets to ultimately develop a custom drug composition.

Our end-to-end process, from nuclease discovery to drug composition, is unique to each disease, resulting in nucleases that are not only highly specific but effective in that they maintain their fidelity. So, while we are broadening the spectrum of treatable diseases, we are also simultaneously engineering an effective treatment, tailor-made to those diseases.

We have only just scratched the surface when it comes to realizing the full potential of gene editing. Our team is comprised of over 120 skilled scientists and passionate PhDs, who are all dedicated to bringing innovation to disease indications.

Our approach to engineering custom nucleases for specific diseases allows us to achieve single-allele editing strategies for even the rarest of indications, such as severe congenital neutropenia (SCN). This debilitating disease is caused by mutations in the neutrophil elastase gene ELANE. Our ability to knock out the single ELANE allele for SCN demonstrates the therapeutic potential of EmendoBio's approach, opening up a wide range of options for gene editing therapies where traditional CRISPR nucleases have previously been ineffective.

We are already seeing strong results from our SCN study in collaboration with Seattle Children's, which is already a great promise in improving the lives of those young patients and their families.
Within the next five years, we're on track to have several indications in various stages of clinical trials with the possibility of our lead indication for SCN being fully approved and available to patients for therapeutic use - and, this is just the beginning. EmendoBio's novel OMNI platform is opening the door to future therapeutics that were previously unimaginable, helping to finally realize the full potential of CRISPR gene-editing to treat all genetic diseases, including difficult-to-treat monogenetic diseases and more. Our innovative technology is moving us toward a world where incurable diseases become curable.

Please provide appropriate references (ie Pubmed links)

Sabo, Peter, et al. "Mutant Allele Knockout with Novel CRISPR Nuclease Promotes Myelopoiesis in ELANE Neutropenia." Molecular Therapy - Methods & Clinical Development, vol. 26, 8 Sept. 2022, pp. 119–131, https://doi.org/10.1016/j.omtm.2022.06.002.

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