



Drug Therapy to Rapidly and Safely Correct Cardiac Arrhythmia

Technology Readiness Level 4: Validated in Laboratory

LEAD INVESTIGATORS

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UNMET NEED

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia encountered in clinical practice. AF patients exhibit increased risks for heart attacks, heart failure, hospitalization, and death. AF is increasing in prevalence, with up to 15.1M cases estimated annually by 2050 in the USA¹ This increase is in large part due to aging of the general population and prolongation of lifespan.

Drugs used currently to restore normal heart rhythm in an AF patient have variable efficacy in different individuals. Further, there are adverse risks associated with their use, including risks of life-threatening ventricular arrhythmias. Accordingly, safer and more effective therapeutic strategies to correct AF are needed.

OPPORTUNITY AND CLINICAL APPLICATIONS

Through research into how heart beat is controlled, LIMR scientists have discovered a way to better manage AF. Specifically, they discovered that gently elevating the level of potassium salts in blood, within the normal range, can dramatically improve the ability of an anti-AF drug to terminate AF rapidly and safely. A key feature of their discovery is a parallel reduction in the risks posed by some anti-AF drugs in triggering life-threatening ventricular arrhythmias. The practical invention emerging from this discovery is a new combination drug treatment to improve clinical management of AF, namely, the addition of a potassium salt tablet to the approved anti-AF drug regimen.

This invention to terminate AF more safely and effectively will be generally applicable in AF patients. However, there are two AF subtypes where this method is especially needed and will be particularly useful:

- **Patients with persistent uncontrollable AF.** Patients are resistant to drug therapy because of differences in the resting electrical properties of their atrial heart cells. By

¹ Miyasaka Y, Barnes ME, Gersh BJ, Cha SS, Bailey KR, Abhayaratna WP, et al. Secular trends in incidence of atrial fibrillation in Olmsted County, Minnesota, 1980 to 2000, and implications on the projections for future prevalence. *Circulation*. 2006;114(2):119-25.

gently elevating blood potassium levels, these electrical properties are altered in a manner that improves their sensitivity to anti-AF drugs.

- **Patients with heart failure who also have AF.** A major fraction of AF patients fall in this category. As noted above, a critical limitation of many approved anti-AF drugs is their risk of inducing a dangerous ventricular arrhythmia when heart failure is evident. By sensitizing atrial heart cells to anti-AF drugs, the gentle elevating blood potassium levels would enable an opportunity to reduce the dose of the anti-AF drug, thereby also reducing its associated risks of triggering a ventricular arrhythmia.
- Additional applications include improving the outcome of the Pill in the Pocket approach and of inhalation therapy to cardiovert AF.

STAGE OF DEVELOPMENT

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The invention has achieved initial proof of concept at the preclinical validation stage.

INTELLECTUAL PROPERTY

Provisional patent application filed August 2022.

LICENSING OPPORTUNITY

LIMR is seeking a licensee to commercialize this invention.

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