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APPLYING TECHNOLOGY READINESS LEVEL FRAMEWORK TO AN ANTIMICROBIAL RESISTANCE RESEARCH CENTER: A CASE STUDY OF ANTIMICROBIAL RESISTANCE INSTITUTE OF SÃO PAULO (ARIES)

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Introdução

Antimicrobial resistance (AMR) represents a critical public health challenge. To effectively combat AMR, it is necessary to develop a robust innovation ecosystem that brings together academia, industry, and government. The Technology Readiness Level (TRL) offers a standardized approach to evaluating and prioritizing projects. This study's main objective was to apply the TRL framework to evaluate research projects at the Antimicrobial Resistance Institute of São Paulo (ARIES) to understand their technological development stages and analyze opportunities for innovation.

Contexto Investigado

AMR was estimated to have caused 1.14 million direct deaths worldwide in 2021, and projections suggest it could lead to 10 million deaths per year by 2050. To sustainably curb AMR, an approach grounded in therapeutics, diagnostics, vaccines, and policies is required. However, due to R&D complexity and market failures, progress has not kept pace with the rapid evolution of AMR, with most innovative therapeutic solutions remaining in the preclinical research phase.

Diagnóstico da Situação-Problema

There is an urgent need for collaborative platforms between academia and industry to accelerate R&D. However, a translational gap exists. Industry often faces difficulties reproducing academic results, while academia perceives industry as lacking technical nuance, which can lead to project abandonment. It is essential to align interests and establish best practices. This study was conducted at ARIES, a research center composed of researchers with distinguished academic trajectories who are expected to deliver outcomes in innovation, not just scientific publications.

Intervenção Proposta

This study applied the Technology Readiness Level (TRL) framework to standardize the understanding of a technology’s development stage at ARIES. The TRL scale measures maturity across nine levels, from basic principles (TRL 1) to commercial use (TRL 9), facilitating the translation of basic research into market applications. To determine the TRL, semi-structured interviews were conducted with nine principal investigators to analyze their projects' scientific foundations, potential applicability, and development challenges.

Resultados Obtidos

Interviews revealed that most ARIES projects are in the initial stages of TRL 1-3, focusing on basic research within the knowledge ecosystem. One project reached TRL 3-4 after establishing an industry partnership. Another project is at an advanced TRL stage (6-7) and was selected for submission to an innovation funding program. Partnerships and financing programs are critical to overcoming the "valley of death" between TRL 4 and TRL 6, and advancing projects to higher TRL levels.

Contribuição Tecnológica-Social

This TRL assessment serves as a starting point to identify mechanisms that facilitate or limit technological advancement in AMR research. It aims to guide the transition of ARIES from a knowledge ecosystem to an entrepreneurial and innovation ecosystem, supporting efforts to mitigate the AMR crisis. This study offers a practical contribution by demonstrating the application of the TRL framework within a biomedical research center, enabling the identification of technologies with innovation potential and supporting more structured approaches to technology transfer and development.