



Unlocking Translational Breakthroughs: Spaces, Technologies, and Supports

Translational science aims to improve predictive and efficient healthcare interventions by translating scientific research into medically relevant applications. This field has evolved significantly over the past several decades, reflecting changes in scientific research, technology, and healthcare needs. With the help of new technologies and effective laboratory spaces such as contract vivarium facilities for pre-clinical in vivo studies, researchers bridge the space between novel scientific discovery and cutting-edge clinical implementation.¹

TRANSLATIONAL FOUNDATIONS AND PROGRESS ACROSS DISCIPLINES

The concept behind translational research gained traction among scientists in the 1990s, as researchers began recognizing gaps between basic biomedical discoveries and practical applications in medicine. Although genomics and biotechnology advances at that time rapidly accelerated the pace of research breakthroughs, these developments were not quickly or effectively translated into therapies, diagnostics, or clinical practices. In the early 2000s, researchers and funding institutions formalized translational science as a discipline, creating infrastructures to directly facilitate the transition of laboratory findings from bench to bedside.¹

In the decades since its inception, translational research has helped new treatment modalities reach once neglected disease spaces. From academic laboratories to biotechnology companies, researchers continue to uncover novel druggable chemistries such as PROTAC and LYTAC, new genetic therapy modalities such as antisense oligonucleotides (ASO) and CRISPR-



Scientists conducting preclinical in vivo studies need in-house or outsourced vivarium spaces, both of which pose challenges for biotechnology and pharmaceutical research. Credit: Mispro

Cas9 gene editing, and revolutionary cellular therapies such as engineered chimeric antigen receptor T cell (CAR T) treatments and stem cell-based therapeutics. As a result, translational scientists broaden the horizon of drug discovery and development, opening the door for novel and improved biologics, oligonucleotides, gene therapies, and cell therapies that transform medical practice across disciplines.¹

Today, translational research is inherently interdisciplinary, involving scientists in many fields, including biologists, chemists, engineers, and medical professionals. It encompasses four phases of research that move knowledge from the laboratory into clinical studies via preclinical animal research and disseminates findings from clinical trials into community practice. This com-



Therapeutic research stages include basic mechanistic studies, discovery screens, in vitro and in vivo pre-clinical models, and clinical trials. Credit: iStock, unoL

prehensive approach ensures that researchers rapidly and efficiently convert scientific breakthroughs into therapeutics that significantly enhance care.^{2,3}

OPPORTUNITIES AND CHALLENGES IN TRANSLATIONAL BIOTECHNOLOGY RESEARCH

Therapeutic research and drug development involves several stages, including basic mechanistic research (pre-discovery); molecular screens for targets, drug candidates, and therapeutic strategies (discovery); characterizing candidates' modes of action, safety, and efficacy with in vitro and in vivo models (pre-clinical); and investigating the drug candidate in humans (clinical). Biotechnology and pharmaceutical researchers must also consider post-market reviewing, monitoring, and regulatory approval.⁴

The path from conceptualizing a medical innovation to successful clinical implementation is far from straightforward, often spanning up to 15 years.⁴ As such, the multistage process of finding new treatment avenues and translating discoveries into viable therapeutics can be challenging and costly, requiring many specialized skillsets, facilities, materials, and technologies. Biological advances and cutting-edge technologies continue to empower translational efforts, but the process remains long, costly, and failure prone.^{4,5}

Early-stage pitfalls can halt progress, while late-stage setbacks, including those encountered during preclinical in vivo studies and clinical development, can significantly deplete resources and waste time and operating costs. Balancing the intricate interplay between financial imperatives and the pursuit of scientific progress

remains a central challenge in the biotechnology and pharmaceutical industries, and this journey necessitates a cohesive effort from a diverse team of experts to navigate the complexities of regulatory approvals, technical challenges, and clinical validation.⁵

Efficient testing and clinically oriented decision-making processes are paramount for researchers seeking to mitigate the risks of novel and proprietary therapeutic discovery and development. Scientists must allocate resources judiciously throughout development stages and account for short- and long-term operating costs. The financial landscape plays a pivotal role in shaping the trajectory of medical innovation, with the cost of bringing translational research to market often ranging from millions to billions of dollars.⁵

For example, scientists conducting preclinical in vivo studies to examine the safety and efficacy of a novel drug candidate need cost-effective facilities and tools that allow them to maintain control over experiments, ensure confidentiality, and achieve expedient discovery, validation, and translation. For biotechnology companies, translational research may involve building an in-house vivarium space from scratch or outsourcing studies to contract research organizations (CRO), both of which pose additional challenges for biotechnology and pharmaceutical research.⁶

Cost of establishing in-house facilities

Building an in-house vivarium may be a prohibitive expense at start-up and a financially risky investment long-term. The average cost to build a vivarium facility in the Boston area in 2023 was \$960 per usable square footage, or \$4.8 million to build a typical five thousand square foot facility.* This cost includes construction, materials, equipment, vendors and partners such as architects, engineers (mechanical, electrical, plumbing, and structural), commissioning professionals, code consultants, and contractors and sub-contractors.⁷ Additionally, an in-house vivarium facility of this size would require on average six on-site daily staff members, including a supervisor, team lead, and animal care technicians, with a collective annual salary of approximately \$402,000.* These costs do not include on-going operating costs such as rent, utilities, additional or replacement equipment and equipment maintenance, and cleaning services, nor technical services and up-

per management for regulatory compliance such as Institutional Animal Care and Use Committee (IACUC) and veterinary oversight, which are both necessary when conducting animal studies.⁷

Outsourcing experimental control and discovery time

Biotechnology and pharmaceutical scientists must weigh the potential value of outsourcing translational research to a CRO against the possible negative effects. Although outsourcing may be a cost-reducing strategy in the short-term, consequences may include lack of internal expertise involved in the experimental process, longer wait times yielding higher long-term total costs, and risks related to project complexity and loss of flexibility.⁸ For example, CRO timelines may be slower than in-house studies due to a lack of specialized expertise or a need to revalidate in-house protocols. This compounds the long-term costs of on going vivarium rental and staffing expenses with the inherent risks of failure prone drug discovery research. Scientists sacrifice precious funding dollars during the waiting process if a study fails, which may financially prevent reiterative bioanalyses, and remove the flexibility to quickly pivot and focus on another suitable target.

SPACE AND SERVICE SOLUTIONS FOR TRANSLATIONAL RESEARCH

Scientists carrying out translational research need outsourcing solutions that lie between this wide range of fully vertical in-house integration and fully virtual third-party execution.⁸ Biotechnology and pharmaceutical companies benefit from the complementarity of both in-house research and external know-how, highlighting the importance of integrating internal and external facilities and tools to reap the positive effects of each end of the spectrum.⁸ Renting space in a contract vivarium (CV) is one such solution.

A CV is a turnkey animal research facility that is accessible to multiple clients for in vivo stage pre-clinical research and development. Such facilities are Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC)-accredited, and fully equipped, managed, and staffed spaces for translational research.⁶ CV rental is less expensive

than building and operating an in-house vivarium, and allows scientists to maintain complete control over their experiments for faster discovery time and less financial waste.

The [Mispro Space and Service CV](#) model addresses the challenges of translational research and drug discovery, including short- and long-term costs, discovery time, and experimental control and confidentiality. The only facility cost incurred by a biotechnology company who chooses a CV is rent for their space, and the only potential staffing cost is a company-hired principal investigator's salary.⁷ Along with fully equipped animal holding and procedure space for in vivo studies, CVs support comprehensive laboratory animal services and regulatory compliance oversight services, removing the need for in-house expenses such as animal husbandry, veterinary oversight, and IACUC for protocol guidance and approval.⁶

CONTRACT VIVARIUM SPACES SUPPORT TRANSLATIONAL DISCOVERY

Mispro Contract Vivarium Facilities support not only multiple fields of translational research, but largely proprietary and novel research pursued by biotechnology companies. Across Mispro CV sites, 32% of scientists are performing proprietary research and 62% of scientists are performing novel research, with notable trends in research fields of gastroenterology, metabolism/endocrinology, and the gut microbiome (7%); neurology, psychiatry, and substance abuse (10%); oncology (23%), and gene therapy and gene editing (26%).⁹ This broad spectrum of research applications highlights the best-of-both-worlds benefit of CVs as critical contributors to cutting edge translational science today, and valuable avenues for future biotechnology and pharmaceutical discoveries.

*This is an average for the Boston market in 2023. Costs vary significantly in relation to real estate, construction, and staffing costs in different regions of the US.

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