



# STRATEGIC PLAN

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## 2018-2028

### Overview

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Texas Biomedical Research Institute

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**TEXAS BIOMEDICAL  
RESEARCH INSTITUTE**

## STRATEGIC PLAN EXECUTIVE SUMMARY

Texas Biomedical Research Institute (Texas Biomed, or the Institute) has the opportunity to dramatically increase our contribution to biomedical research. While we hold a prolific and rich history of significant research accomplishments, these achievements have been dispersed across a wide array of research areas. In the current and future research environment it is essential to create a greater focus. After reviewing the core competencies of Texas Biomed, along with the potential market for biomedical research, this plan creates a primary focus for Texas Biomed of infectious disease research. By 2050, infectious diseases are projected to be the #1 killer globally costing \$100 trillion. The global market for biomedical research is projected to grow nearly 60% in the next five to six years. Thus, there is a positive convergence between our core competencies and the marketplace, one which reinforces this decision to focus on infectious diseases.

The Texas Biomed mission is ***to pioneer and share scientific breakthroughs that protect you, your families and our global community from the threat of infectious diseases.***

Current strengths supporting this mission include: our historical achievements in infectious disease research, the commitment and quality of our workforce, our unique resources (especially our biocontainment and primate center), our environment, our history and reputation, and our new leadership. Current weaknesses include: silo'ed culture, aging facilities and infrastructure, inadequate scientific facilities, inefficiencies in research support, insufficient systems, and limited opportunities for training and development for our scientists and staff.

In the coming years, we anticipate a number of opportunities that will increase recognition of the need for our research, produce new funding, and provide technological innovations that will help advance our science. However, we can also anticipate greater competition for research funding, more competition for the level of scientists and staff we need and increasing costs for conducting scientific research.

In examining current and projected future conditions, we have established a **10-year Vision for Change** at Texas Biomed as follows:

*Texas Biomed is a world leader in infectious disease research, the premier source of transformational discovery, holding a strategic portfolio of multidisciplinary capabilities.*

*Our fellow scientists and the global community view us as a major source of key discoveries that contribute to the health and wellbeing of people and animals.*

*Widely known as being a “best place to work”, we have recruited, developed, and retained an extensive team of outstanding scientists and support staff.*

*Our facilities and technologies are contemporary, state-of-the-art, with co-laboratory spaces that optimize our scientists’ ability to conduct breakthrough discovery activities.*

*Our highly collaborative culture is considered a key competitive advantage.*

*We enjoy the wide support of our larger community in San Antonio and beyond.*

*Our diverse funding sources create a sustainable base for the continuing development and expansion of our activities and contributions to society.*

In order to achieve this vision, Texas Biomed will focus on addressing six critical strategic issues:

1. **Science and Technology:** *Focusing, staffing, equipping, and organizing our scientific endeavors to fulfill our critical role in the area of infectious disease biomedical research.*
2. **Organizational Structure:** *Delivering an administrative structure and environment that optimally and efficiently supports scientists in their research endeavors.*
3. **Training and Career Development:** *Creating an educationally rich learning environment for all staff (scientific, veterinary and support), grad students and postdocs, and the San Antonio community.*
4. **Facilities and Infrastructure:** *Providing the space and physical environment that supports world-class science and attracts and retains the best quality scientists and other employees.*
5. **Culture:** *Fostering our ability to work collaboratively in a high-performing, values-based culture.*
6. **Business Development:** *Ensuring a diverse and sustainable business model that infuses the level of resources needed to sustain our high quality science.*

We will pursue key strategies to address these issues:

- Organize Texas Biomed's research into three overlapping scientific programs:
  - Host-Pathogen Interactions
  - Disease Intervention and Prevention
  - Population Health
- Recruit additional outstanding scientists to strengthen areas of focus and fill key gaps, doubling the size of the current faculty.
- Establish and strengthen the core services to provide high quality, cost effective support for science.
- Reorganize and streamline administrative support for science.
- Strategically redesign the campus to enhance functionality and increase the level of collaboration and camaraderie throughout the Institute.

- Establish strong training, career development, and outreach programs to create an intellectually rich learning environment throughout the Institute and within the larger community.
- Create a unified Texas Biomed culture based on our core values of Teamwork, Integrity, Diversity, Excellence, and Safety.
- Establish a diversified business portfolio that ensures sustainability of operations.

We created detailed action plans for each strategy to accomplish these goals.

The strategic plan is built on a solid foundation by:

- Incorporating the best thinking of our capable and committed employees.
- Taking advantage of an extensive benchmarking process to ensure that we are incorporating best practices from comparable institutions and organizations.
- Integrating extensive foresight analysis from a prestigious firm (TEconomy Partners) to ensure that we have targeted ourselves toward a future that legitimately appears to be ripe with possibility and matches the inherent potential and capabilities of Texas Biomed.
- Monetizing the entire plan to ensure that it is as feasible and cost-realistic as possible.

In other words, this plan is as evidence-based and forward-thinking as possible, given that any strategic plan is subject to the vagaries of unanticipated events and trends.

The success of any strategic plan lies in its effective implementation. Therefore, we established a robust implementation structure to ensure that the various action plans are effectively monitored and communicated, and that the plan is adjusted over time to account for changing conditions and opportunities. Champions are aligned to each plan to ensure we accomplish the actions and identify adjustments needed to the action plans.



## CONTEXT

Texas Biomed has a rich history. Our many accomplishments have in particular focused on providing deeper understandings of the mechanisms of disease in areas such as HIV, Ebola, tuberculosis, and malaria—diseases that together have resulted in enormous levels of human suffering and economic costs that are almost incalculable. Texas Biomed can rightly take pride in having played a significant role in helping to create the information that has led to cures and mitigating treatments, as well as a knowledgebase that will in the future help lead to even greater advances.

The Institute possesses a highly capable scientific staff and unique resources - particularly the Southwest National Primate Center (or the Primate Center) and the biocontainment facilities (especially ABSL-4). Taken together, these represent an enormous competitive advantage that the Institute can leverage. And yet, historically the Institute has not chosen to systematically target its resources. Rather it has taken an open and diversified approach toward its research program, whereby investigators, in the best tradition of scientific curiosity, have pursued their own areas of interest.

However, the future of biomedical research is becoming increasingly competitive, leading to the need to optimize efforts in order to achieve the greatest impact. All of this has led the Institute to consider where its unique resources are used to their best advantage. And the answer is that the Institute will focus itself on understanding the biology of infectious diseases and contribute to their management and eradication.

### **Why Infectious Disease?**

By 2050 it is estimated that infectious diseases will be the #1 killer globally costing \$100 trillion dollars. But it may not take that long for the impact of infectious diseases to materialize. In May 2017, Time magazine published a front page article on the nation's preparedness for a global pandemic. The bottom line is we are not prepared. Since 1980, the number of dangerous biomedical outbreaks per year has tripled. We only hear about ones that cross international lines or kill vast numbers of people, and even then, we underestimate the threat. It is estimated that at least 25% of the approximately 60 million annual deaths in the world are due to infectious diseases. As much as 50% of these infectious diseases are due to HIV, tuberculosis (TB) and malaria. 12% of TB and HIV infections are TB/HIV co-infections, which Texas Biomed has unique capabilities to impact.

In addition to these raging diseases, there have been in recent years continuing emerging and re-emerging pathogens such as Ebola, Dengue, SARS, and Zika. Another major threat not far on the horizon is drug resistant superbugs. Such antibiotic resistant infections, which are projected to increase in both virility and incidence, currently affect annually 2 million people and cause 23 thousand deaths.

So, what is the cost of these diseases? Of most immediate consequence is human suffering. However, there are major economic consequences behind these diseases:

- Infectious diseases were associated with an economic burden of over \$120 billion in the U.S. in 2014, according to the [Centers for Disease Control and Prevention](#).
- Antibiotic resistant infections cost Americans \$20 billion in direct medical costs and \$35 billion in lost productivity in 2014, according to the [World Health Organization](#).
- In 2014, researchers estimated that seasonal flu cost Americans \$10.4 billion in direct medical costs and \$76.7 million in indirect costs. Vaccinations for the flu can save \$80 per person vaccinated per year by preventing costly hospitalizations, according to [Trust for America's Health](#).

Further, these are just the costs for the United States. This economic burden is vastly increased when one considers the global impact of these diseases. The Institute has historically been committed to addressing issues of both national and global importance. Since many of the infectious diseases originate in foreign locales, it is in the best interest of the nation for us to address these issues from an international perspective.

See Appendix- Core Competency and Foresight Analysis for more information on the future of infectious disease research.

### **Why Texas Biomed?**

While there has been a broad range of areas of research at the Institute, Texas Biomed has historically had a particular strength in the arena of infectious diseases. In recent years, we have directly focused on HIV, malaria, tuberculosis, and Ebola. Beyond that, we have the core capacities and interests in the underlying processes that holds the study of all these diseases together-- genetics and the “omics”, data sciences, inflammation and immunity. We also have some of the most advanced capability in the use of Non-Human Primate (NHP) models for studying human disease and conditions. And, through our maximum containment facilities at the BSL-3 and 4 levels, we are well-equipped to complete studies to make rapid and critical advances in understanding and ultimately developing strategies for addressing these infectious diseases.

We have traditionally not employed a targeted Institute-level strategy around the research we conduct. In the best spirit of science, we have encouraged our scientists to pursue their natural interests, and to encourage our donors to fund whatever they are motivated to support. However, it has become abundantly clear that the future of science is team-based. Much funding of science now requires a collaborative and multi-disciplinary approach. Further, it is clear that unless there is critical mass established in key areas, it is difficult to generate the depth of research to tackle the most important scientific issues.

Therefore, the Institute is committed to a strategy of focusing on infectious disease research through a collaborative approach. This is a fundamental shift that impacts the entire strategic plan. It is not, however, a major departure from our historical strengths; rather it is capitalizing on and amplifying those strengths in a coordinated and intentional way to ensure that the Institute becomes one of the most vital and significant sources of infectious disease research nationally and globally.

## MISSION & CORE VALUES

The mission of Texas Biomed is **to pioneer and share scientific breakthroughs that protect you, your families and our global community from the threat of infectious diseases.**

The strategic plan, then, is the Institute's approach to optimizing this mission over the next ten years.

### CORE VALUES:

The following are the core values and behaviors to which Texas Biomed is committed in all we do:

- \* **Teamwork:** Works collaboratively with others to achieve a common goal. Respects contributions of all team members. Fosters an environment where teamwork is valued and rewarded.
- \* **Integrity:** Displays compassion, care and respect towards team, animals, and community. Demonstrates the highest standards of professional and ethical behavior. Operates with transparency and honesty in everything we do.
- \* **Diversity:** Embraces all differences as they contribute to the richness of our community. Values and promotes full utilization of workforce diversity. Respects others' ideas, beliefs, backgrounds and opinions to drive excellence.
- \* **Excellence:** Promises to employ the most innovative solutions, technologies, and ideas to all areas. Fosters an environment of continuous improvement to produce quality science. Explores creative approaches to problem solving. Holds all accountable to the highest standards of job performance and customer service.
- \* **Safety:** Exhibits personal responsibility for the safety of ourselves, team, animals, and community. Follows all protocols and complies with all regulations to ensure the safest environment that will produce quality research. Encourages new ideas through development of a psychologically safe environment.

## VISION FOR CHANGE AND CRITICAL STRATEGIC ISSUES

### **10-year Vision for Change:**

*Texas Biomed is a world leader in infectious disease research, the premier source of transformational discovery, holding a strategic portfolio of multidisciplinary capabilities.*

*Our fellow scientists and the global community view us as a major source of key discoveries that contribute to the health and wellbeing of people and animals.*

*Widely known as being a “best place to work”, we have recruited, developed, and retained an extensive team of outstanding scientists and support staff.*

*Our facilities and technologies are contemporary, state-of-the-art, with co-laboratory spaces that optimize our scientists’ ability to conduct breakthrough discovery activities.*

*Our highly collaborative culture is considered a key competitive advantage.*

*We enjoy the wide support of our larger community in San Antonio and beyond.*

*Our diverse funding sources create a sustainable base for the continuing development and expansion of our activities and contributions to society.*

We identified the following six strategic areas that are the most critical between now and 2028 in order to achieve this vision for change:

1. Science and Technology: *Focusing, staffing, equipping, and organizing our scientific endeavors to fulfill our critical role in the area of infectious disease biomedical research.*
2. Organization Structure: *Delivering an administrative structure and environment that optimally and efficiently supports scientists in their research endeavors.*
3. Training and Career Development: *Creating an educationally rich learning environment at Texas Biomed for all staff (scientific and support), grad students and postdocs, and the San Antonio community.*
4. Facilities and Infrastructure: *Providing the space and physical environment that supports world-class science and attracts and retains the best quality scientists and other employees.*
5. Organizational Culture: *Fostering our ability to work collaboratively in a high-performing, values-based culture.*
6. Business Development: *Ensuring a diverse and sustainable business model that infuses the level of resources needed to sustain our high quality science.*



## CRITICAL STRATEGIC ISSUE #1

### SCIENCE AND TECHNOLOGY

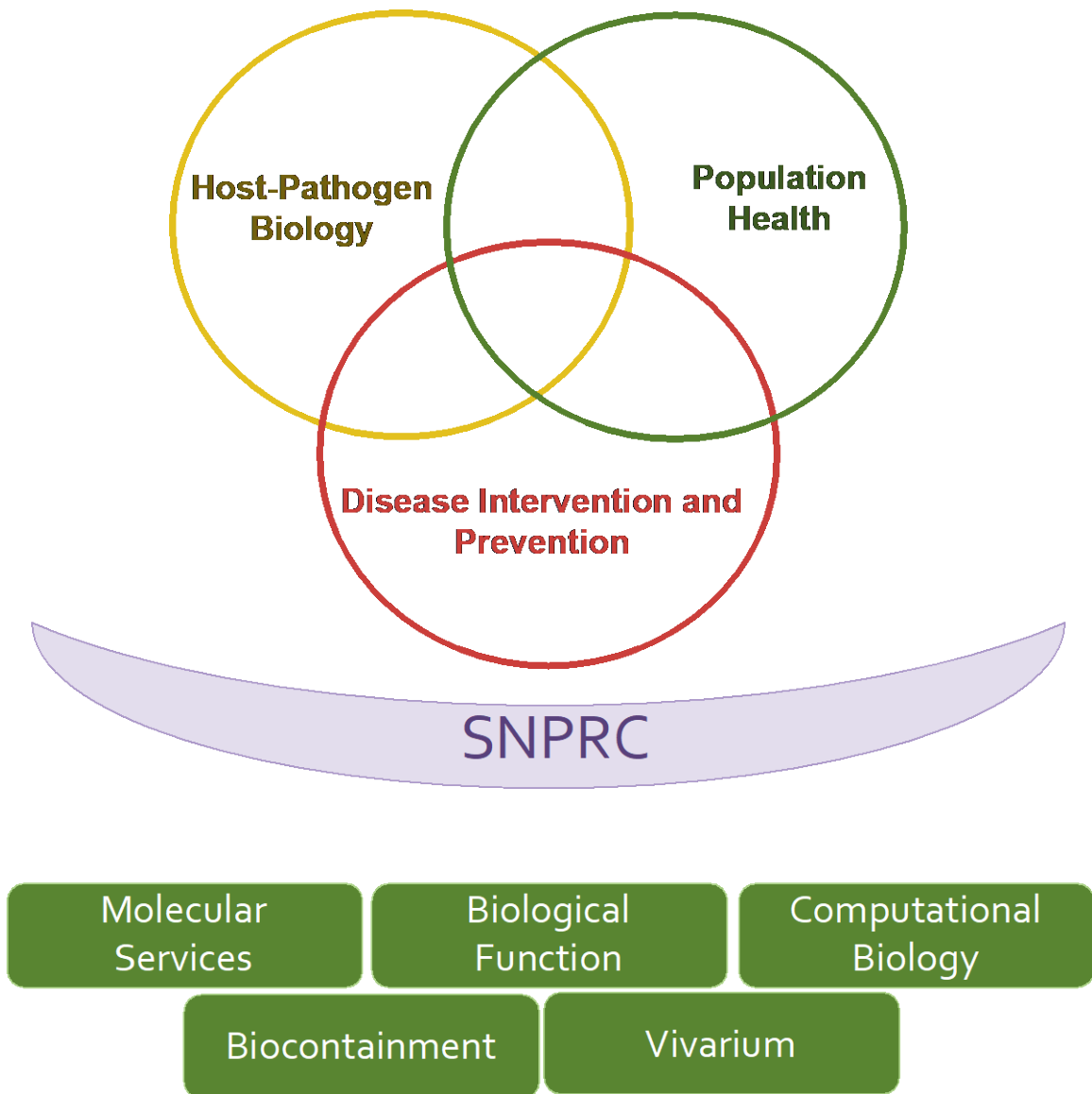
***Issue:** Focusing, staffing, equipping, and organizing our scientific endeavors, in order to fulfill our critical role in the area of infectious disease biomedical research.*

#### **Why must Texas Biomed address this issue:**

Creating a scientific focus with an appropriate structure and resources is the key to survival in a research environment marked by increased competition for scarcer funding. Focusing Texas Biomed's research effort is also fundamental to enhancing our reputation as a research institute that is effectively targeting key societal concerns and contributing to their solutions. Finally, if Texas Biomed does not address this issue, the Institute will fail to recruit and retain the level of talent needed to grow our research portfolio.

#### **What strategies will we pursue to address this issue:**

1. Reorganize science in a way that builds on current strengths and consolidates our areas of focus so our efforts are coherent and synergistic (***see Appendix-- Core Competency and Foresight Analysis***):
  - a. Current strengths are largely in areas of infectious disease research.
  - b. Three focus areas are Host-Pathogen Interactions, Disease Intervention and Prevention, and Population Health.
2. Recruit additional outstanding scientists to strengthen key areas of interest and fill gaps:
  - a. Build critical mass in existing areas of strength and newly emerging areas where research is projected to grow.
  - b. Use cluster hires to further build critical mass.
  - c. Double the size of the faculty.
3. Provide institutional support and mentorship for academic success (grant writing, publications, etc.) for both new and existing faculty:
  - a. Extend training, mentorship and career development to scientists, as well as other staff.
  - b. Provide scientists with formal metrics for annual achievements and promotion. Reward achievement and provide consequences if achievements are not met.
4. Establish and strengthen the core services to provide high quality, cost-effective support for science.
  - a. Provide strong institutional support, but target to recoup up to 50% of running costs from user fees.
5. Foster a culture of collaboration and teamwork to maximize multi-disciplinary science, including internal and external collaborations.



**What is the goal:**

Texas Biomed will be a highly competitive internationally recognized scientific institution focused on infectious disease research with a strong funded research portfolio.

### Science and Technology Action Plan:

<b><i>What Will We Do</i></b>	<b><i>By When</i></b>	<b><i>Who Is Accountable</i></b>
Name scientific program leads/co-leads. <b>(see Appendix – Scientific Program Overview)</b>	Completed	CEO; VP, Research
Identify 3-4 thematic areas per program to target expansion or build out. <b>(see Appendix – Scientific Program Overview)</b>	Completed	Program leads and co-leads; CEO; VP, Research
Launch programs internally and align current faculty.	In progress	Program leads and co-leads; CEO; VP, Research
Launch programs externally (web site and marketing materials, etc.)	January 2019	Assistant VP, Communications;
Build recruitment plan including cluster hire targets.	Q1 2019	Program leads and co-leads; CEO; VP, Research
Recruit new scientists.	2018 - 2023	Program leads and co-leads; CEO; VP, Research
Establish rigorous promotion criteria for faculty.	December 2018	VP, Research
Develop and implement faculty mentoring program.	Pilot 2018 Full by Q2 2019	VP, Research
Develop and implement grant writing programs.	In Process for Staff Scientists Faculty Q2 2019	VP, Research
Identify interim core leads.	Q1 2019	CEO; VP, Research
Build core business plans.	Q2 2019	CFO; Interim Core Leads VP, Research
Recruit core leads.	2018 - 2023	CEO; VP, Research

## **CRITICAL STRATEGIC ISSUE #2 ORGANIZATIONAL STRUCTURE**

**Issue:** *Delivering an administrative structure and environment that optimally and efficiently supports scientists in their research endeavors.*

### **Why must Texas Biomed address this issue:**

To successfully grow and enhance research at Texas Biomed, scientists will rely on support from a variety of areas that is accessible, reliable, efficient and customer-focused. At the same time, it will be essential to control the costs of those services to maintain financial stability. We need to address this issue to ensure we have adequate support capacity to grow our science. At the same time, we need to ensure that administrative costs do not grow excessively.

### **What strategies will we pursue to address this issue:**

1. Reorganize scientific support on a centralized basis to provide a consistent and right-sized staff for each of the support functions.
2. Implement clear policymaking that is appropriate and engages relevant parties.
3. Develop and implement procedures that are effective, efficient, and accessible.
4. Ensure that support staff are well-trained and cross-trained to ensure sufficient depth of expertise.
5. Provide clear service standards for all support services, along with accountability for quality and timeliness.
6. Ensure consistent, effective, and transparent communication about support activities.
7. Create a culture within the support organization of empowerment, customer service, and accountability.

### **What is the goal:**

Science at Texas Biomed will be well-supported by highly efficient, effective, and customer-focused support services.

### Organization Structure Action Plan:

<b>WHAT WILL WE DO</b>	<b>BY WHEN</b>	<b>WHO IS ACCOUNTABLE</b>
Create Research Support Services to integrate and streamline administrative support for scientists (includes co-location, communication, training, policies and SOPS for Sponsored Programs Administrators and Research Administrative Assistants).	Completed	Director of Research Support Services; Manager of Sponsored Programs Administration; Manager of Research Administrative Support
Create satisfaction surveys for all administrative units, to be monitored continuously and sent to unit leads.	January 2019	Operations Coordinator
Identify and implement efficiencies and other improvements in Purchasing, HR, Finance, SNPRC Finance, Operations, Advancement and Research Coordination.	Q1 2019 under the leadership of the new CFO	Co-Chair of Organizational Structure; Heads of Each Department
Establish a “guideline” document system to associate with SOPs, in particular for SNPRC staff where SOPs are critical and best practices guides are useful for on-the-job training.	Q1 2019 under the leadership of the new SNPRC director	SNPRC leadership
Establish quality improvement plan – formal processes for identifying issues, addressing concerns and follow-up.		SNPRC leadership
Create a strategic plan/vision for IT. <b>(see Appendix – IT Vision Integration with Strategic Plan)</b>	Completed	CTO
Audit and assess all administrative roles and departments for the right size, skillsets and value.	December 2019	Co-Chair of Organizational Structure; Heads of Each Department
Explore Six Sigma relevance and applicability to internal processes.	December 2019	Co-Chair of Organizational Structure; Heads of Each Department
Implement all other technology as determined by CTO.	December 2020	CTO and other departments
Benchmark similar organizations on relevant action items.	Ongoing	Co-Chair of Organizational Structure; Heads of Each Department



## **CRITICAL STRATEGIC ISSUE #3**

### **TRAINING AND CAREER DEVELOPMENT**

***Issue:** Creating an educationally rich learning environment at Texas Biomed for all staff (scientific and support), grad students and postdocs, and the San Antonio community.*

**Why must Texas Biomed address this issue:**

Creating a learning environment at Texas Biomed is essential to becoming a world-class research institution. Not only will it keep our scientists and staff engaged and motivated, but it will also ensure that we are maintaining a highly skilled and productive workforce. Recruitment efforts will be significantly aided by offering an environment of continual growth. Postdocs and graduate students will be drawn to Texas Biomed, seeing it is a place to further their education. The larger research and scientific community will view Texas Biomed as a key player in hosting workshops and conferences that advance science both nationally and internationally. And finally, having a strong outreach component will help cement our reputation within San Antonio as a vital and inspiring part of the community.

**What strategies will we pursue to address this issue:**

1. Design a training and career development program that is based on best practices, in line with Texas Biomed's mission and values, is accessible, equitable, and provides opportunity for employee advancement.
2. Strengthen the outreach efforts to encompass both educational efforts for younger people and general awareness for the community.
3. Strengthen relationships with local universities and educational institutions.
4. Strengthen the "inreach" efforts to foster greater understanding of activities across the Institute and build a greater sense of a Texas Biomed community.
5. Strengthen commitment from our administration to model a learning culture, and to invest the time, resources and funds necessary for an effective and dynamic training and career development program.

**What is the goal:**

Texas Biomed will have a rich learning culture for all employees, as well as those that interact with Texas Biomed, that encourages ongoing development of skills and knowledge.

### Training and Career Development Action Plan:

<b>WHAT WILL WE DO</b>	<b>BY WHEN</b>	<b>WHO IS ACCOUNTABLE</b>
Develop a holistic view of training, career development and outreach and establish a work team to design and prepare for the transition to a training and career development office.	Completed	Assistant VP, HR; Assistant VP, Communications; VP, Research; SNPRC Training Department; Action Team Leads
Develop and communicate a model to centralize the knowledge of required and available training.	Q1 2019	Training and Career Development Work Team
Implement the Learning Management module of the Talent Management System.	Q1 2019	Assistant VP, HR; CTO
Hire a Director and establish a training and career development office.	Mid-2019	Assistant VP, HR; Director, Training & Career Dev
Establish a training and career development council to advise and assist; including setting priorities for training content and audiences.	Fall-2019	Director, Training & Career Dev
Create a career path map for entire institute to help participants chart their career.	First set of career maps: mid-2019 All maps: 2021	Director, Training & Career Dev
Begin implementing career development programs for non-technical training based on assessed needs.	2019	Director, Training & Career Dev
Create a group of volunteers to plan for and implement an extension of the Institute's outreach programs.	2020	Director, Training & Career Dev; Assistant VP, Communications;
Develop and implement population-specific onboarding processes (e.g. grad students, postdocs, and current employees going through the newly-developed program).	2018	Assistant VP, Human Resources
Enhance outreach program to include key activities like science camps.	Begin 2021	Outreach Coordinator
Evaluate training/internship and outreach programs to assess return on investment.	2021 and ongoing	Director, Training & Career Dev; Training and Career Development Council; Outreach Coordinator
Develop and implement an "affinity group" program.	2021	Director, Training & Career Dev Office
Benchmark, design and launch workshop series for the scientific research community.	2022, launch first workshop	Director, Training & Career Dev Office; Outreach Coordinator
Host larger scale workshops and conferences drawing on success of earlier workshops.	2023	Director, Training & Career Dev Office; Outreach Coordinator

## **CRITICAL STRATEGIC ISSUE #4 FACILITIES AND INFRASTRUCTURE**

***Issue:** Providing the space and physical environment that supports world-class science and attracts and retains the best quality scientists and other employees.*

### **Why must Texas Biomed address this issue:**

Texas Biomed is preparing for one of the greatest transformations in its history. While the essence of this transformation is focusing and expanding the scientific enterprise, the campus design will be a major reflection and enabler of this transformation. Recruitment and retention of A-level scientists and staff requires space that is both inspiring and highly functional. The creation of the new campus will have a significant impact on shifting the culture of Texas Biomed to one of institutional pride and collaboration. Overall, the new campus will help secure the identity of Texas Biomed as a highly esteemed player nationally and internationally in the scientific field of infectious disease research.

### **What strategies will we pursue to address this issue:**

1. Provide modern, high-performing and efficient research, office, scientific support, amenity, and animal spaces that enable and inspire the best in everyone, every day.
2. Phase the rebuilding of the campus in a manner that priorities need, minimizes disruption to researchers, animals, and support functions, and aligns with anticipated funding.
3. Provide a welcoming entry for staff and visitors but also secure the sensitive research and animal areas from an expanding local population and freeway system.
4. Incorporate natural resources, materials, climate, and cultural references to create an inspirational campus: one that recognizes past achievements and donors through visible, respectful, and modern approaches.
5. Provide an environment in which a collaborative research culture can thrive.

### **What is the goal:**

Texas Biomed will develop a campus that enables recruitment and retention of the brightest scientists and most capable staff to fulfill the strategic goals for scientific research.

***See Appendix -- Path to Rebuild Campus***

### Facilities and Infrastructure Action Plan:

<b><i>What Will We Do</i></b>	<b><i>By When*</i></b>	<b><i>Who Is Accountable</i></b>
Renovate Slick-Urschel for new ABSL-3	Started	Assistant VP, Facilities
Build BSL4 Annex	Started	Assistant VP, Facilities
Install CPS Energy secondary electric feed	Jan 2019	Assistant VP, Facilities
Design: new baboon/maaque facilities and new shipping/receiving facility	Jan 2019	Assistant VP, Facilities
Build: new baboon/maaque facilities and new shipping/receiving facility	Sept 2019	Assistant VP, Facilities
Site improvements	June 2019	Assistant VP, Facilities
Utility improvements	June 2019	Assistant VP, Facilities
Demolish approx. 50 buildings (130k ft <sup>2</sup> )	Dec 2019	Assistant VP, Facilities
Design: new central research building	Oct 2019	Assistant VP, Facilities
Design: new translational research building	Oct 2019	Assistant VP, Facilities
Renovate Slick-Urschel for new ABSL-3	Aug 2018	Assistant VP, Facilities
Partially demolish Building 12 South.	2020	Assistant VP, Facilities
Partially renovate Building 12 (NSF).	2021	Assistant VP, Facilities
Demolish/remove trailers.	2022	Assistant VP, Facilities
New CUP 1 and site facilities.	2023	Assistant VP, Facilities
Build new research 1- lab, office, auditorium, café, training.	2024	Assistant VP, Facilities
Build new animal support spine.	2024	Assistant VP, Facilities
Create new site improvements- roads, parking.	2024	Assistant VP, Facilities
Create new staff/visitor entry; site improvements.	2024	Assistant VP, Facilities
Build new Translational 1- ABSL-4.	2025	Assistant VP, Facilities
Demolish buildings Phase Two*.	2025	Assistant VP, Facilities

\* Facilities and Infrastructure Action Plan 2018-2019 “starts”

## CRITICAL STRATEGIC ISSUE #5

### CULTURE

***Issue:** Fostering our ability to work collaboratively in a high-performing, values-based culture.*

**Why must Texas Biomed address this issue:**

Organizational culture is increasingly recognized as a source of competitive advantage and is key to high performance and innovation. A strong unified culture is also an impactful recruitment tool. Creating new programs, organizational structures, and buildings will all help create transformation at Texas Biomed. However, it is how Texas Biomed employees embrace the new culture that will ultimately determine our ability to produce and innovate. And if we are successful in creating this new culture, it will ultimately translate to our ability to generate new discoveries, attract and retain talented scientists and support staff, create high performance, and establish a foundation of financial sustainability.

**What strategies will we pursue to address this issue:**

As part of the process we defined and committed to a set of core values for the organization: Teamwork, Integrity, Diversity, Excellence, and Safety (see page 7).

1. Incorporate values into recruitment and hiring so that all employees are committed to the values, in addition to having the other qualifications that the job requires, on day one.
2. Train employees on values and specific behaviors that are expected.
3. Reinforce the values-centric culture through effective communication.
4. Tie performance management, rewards and recognition to values.
5. Ensure leadership fully embraces, models, and reinforces the values consistently over time.

**What is the goal:**

Texas Biomed's culture will support collaborative science by embedding shared values and behaviors into all processes.



### Culture Action Plan:

<b><i>What Will We Do</i></b>	<b><i>By When</i></b>	<b><i>Who Is Accountable</i></b>
Define the Texas Biomed core values and associated behaviors.	Completed	Culture Action Team
Launch values throughout organization.	Completed	Culture Action Team
Implement a Management Boot Camp to equip all managers with the skills for advancing the values.	Completed	Assistant VP, HR
Hire a Learning & Development (L&D) Specialist.	Completed	Assistant VP, HR
Establish Formal Onboarding Program to educate managers and employees about values and expectations from day one.	Completed	Culture Action Team Leads; Assistant VP, Communications
Standardize behavioral based interview questions that integrate values into the recruitment process.	Phased Approach through Q1 2019	Assistant VP, HR Management Personnel
Incorporate values within the performance evaluation system.	Completed	Assistant VP, HR; Assistant VP, Communications
Develop a values communication strategy including written communications, visual displays, and other means to keep the values in focus for all employees.	September 2018	Assistant VP, HR; Assistant VP, Communications
Implement a Talent Management System that incorporates and reinforces values.	Q1 2019	Assistant VP, HR; Director, Quality Assurance; CTO
Design Recognition Programs for staff and scientists that reinforce values.	December 2019	Assistant VP, HR; Assistant VP, Communications
Implement a Leadership Institute that equips leaders with the knowledge and skills to lead an organization that is based on the values.	June 2020	Assistant VP, HR
Establish succession plan that ensures that the values will be adhered to in a sustainable way.	December 2020	Assistant VP, HR Management Personnel
Create common space for employees to interact (e.g. coffee shop) and create programming to encourage interaction.	2022	Assistant VP, Facilities Assistant VP, HR

## **CRITICAL STRATEGIC ISSUE #6**

### **BUSINESS DEVELOPMENT**

***Issue:** Ensuring a diverse and sustainable business model that infuses the level of resources needed to sustain our high-quality science.*

#### **Why must Texas Biomed address this issue:**

Texas Biomed's largest source of revenue is National Institutes of Health (NIH) grants and contracts; which do not cover all of the indirect costs associated with running the Institute. The Strategic Plan will be funded through a comprehensive Capital Campaign. The new buildings, building improvements, increase in number of investigators and other changes will significantly increase the annual operating budget requirements. Texas Biomed must examine new business opportunities consistent with its mission to provide sustainable funding for ongoing and new operations.

#### **What strategies will we pursue to address this issue:**

1. Increase focus on projects that provide both direct and indirect revenue.
2. Utilize financial modelling based on the assumptions for hiring, building and program development to guide and monitor the operation of the Institute as it undergoes and sustains its transformation.
3. Design a business development program that is based on best practices to target non-NIH funding and other revenue opportunities (e.g. patents, licenses, programs etc.).
4. Develop and execute a capital campaign to attract private and public investments of \$250,000,000 over the next 10 years.

#### **What is the goal:**

Texas Biomed operations will be revenue-positive after expenses.

### Business Development Action Plan:

<b>WHAT WILL WE DO</b>	<b>BY WHEN</b>	<b>WHO IS ACCOUNTABLE</b>
Develop a list of non-NIH funding agencies based on their interest and funding portfolio. Circulate regularly to scientists for use in targeting grants.	Completed	Director, Research Support Services
Develop Capital Campaign Planning Study.	Completed	CEO; VP, Advancement and PR
Launch Capital Campaign.	January 2019	CEO; VP, Advancement and PR
Establish a Wills & Bequests Program.	Q3 2019	VP, Advancement and PR
Translate the financial model used to understand the operating impact of the Strategic Plan into Texas Biomed's budget.	October 2018 for 2019 – 2028	CFO; Director of Finance
Create a policy for non-NIH funders that removes the F&A distinction, providing one fee that includes both direct and indirect.	December 2018	CFO; Director, Research Support Services
Create a policy for inclusion of indirect costs in major (\$100,000+) donor-funded research.	December 2018	CEO; VP, Advancement and PR
Hire a Director of Business Development Office linked to CFO office to build initial revenue diversification efforts.	Q2 2019	CFO
Initiate 'selective' (but not limited) partnerships with pharma and military.	2020	CEO; VP, Research VP, Development
Develop and implement an Intellectual Property (Patents & License Agreements) strategy.	2020	Director, Business Development
Evaluate potential of sales or alternative uses of excess real estate.	2019 – 2020	CEO; CFO; Assistant VP, Facilities
Spin business development office from CFO Office.	2023	CFO
Expand business development activities to larger efforts (e.g. programs; lease space not needed for Texas Biomed operational purposes to start-up activities and/or companies).	2023	CFO; Director, Business Development
Monitor and assess effectiveness of Business Development efforts; expand, modify, or discontinue elements as appropriate.	2025 and ongoing	CEO; CFO; Director, Business Development

## APPENDIX

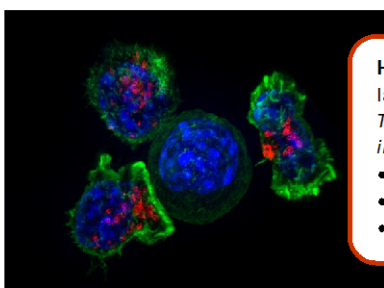
### Scientific Program Overview

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## NEW SCIENTIFIC PROGRAMS

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Following the conclusion of strategic planning and approval of the 10 year plan by the board in June, we began a rigorous process with meetings to further develop the 3 scientific programs which will replace the departments. A program lead and co-lead were selected among the faculty for each of the programs, broadly representing several of the strength areas at our Institute. They were charged with defining three specific areas within their program that will be the focus for growth through Institute investment in recruitment and programming going forward. Below are the three program areas and their focus areas.



#### Host-Pathogen Interactions (HPI)

Ian Cheeseman (Lead) and Luis Giavedoni (Co-Lead)

*The basic biology of infection in humans and animals; the immediate intersection of host and pathogen, including:*

- Genetic variation and infectious disease pathogenesis
- Mucosal immunology
- Emerging *in vitro* and *in vivo* models of infectious diseases



#### Disease Intervention & Prevention (DIP)

Tim Anderson (Lead) and Ricardo Carrion (Co-Lead)

*Development of diagnostics, treatments and vaccines to reduce the severity of/or cure infection.*

- Multi-drug resistant pathogens and hospital-acquired infections
- Experimental diagnostic and therapeutics for infectious diseases
- Next generation vaccine development



#### Population Health (PH)

Jordi Torrelles (Lead) and Shelley Cole (Co-Lead)

*Identification of correlates of disease susceptibility or resistance to infectious diseases on a population level.*

- Host genetic and pathogen-driven host epigenetic programming
- Population immune and metabolic phenotypes and susceptibility to infection
- Environmental impact on host responses to infection

## APPENDIX

### Integration of Information Technology into the Overall Strategic Plan

Texas Biomedical Research Institute's Information Technology (IT) systems, infrastructure, and processes do not support the bold **10-year Vision for Change**.

Aging computing equipment<sup>1</sup>, many running on unsupported software increases the complexity of maintenance and prohibits collaboration as the platforms cannot easily "talk to each other". Key systems are at or past "End of Life", meaning vendors for those systems will no longer support it with code patches, hardware replacement, or maintenance. Some major operations are supported by Excel spreadsheets and paper records, which is manually intensive and risks data loss and integrity. Lastly, the fragmented and siloed IT management and services limits focus on customer service, best practices, and the drive to stay current with new technologies and tools.

Addressing these issues provides Texas Biomed with an opportunity to build a state-of-the-art computing infrastructure supported by an IT team focused on delivering services and support the Institute needs to lead the world in infectious disease research. Our IT strategy is two-fold:

- Evolve to a new computing model for the institute utilizing solutions that provide employees with standard access to the latest technologies and allows the Institute to scale computing infrastructure on demand.
- Build a Unified IT Team focused on continuous learning and customer service.

This strategy directly aligns to the Texas Biomed's vision to have technologies that are contemporary and promote a collaborative work environment. It also supports specific strategies within the Strategic Plan:

#### **Science and Technology:**

A specific strategy for Science and Technology is to *Establish and strengthen the core services to provide high quality, cost-effective support for science.*

Computational Biology is one of the five cores in which Texas Biomed will invest and excel. Exceptional computational facilities are central to modern biological research. The computational biology core will provide institutional support for technology focused around analysis of data such as bioinformatics, and analysis of "big data".

The Genetics Computing Center (GCC) operates with approximately 1000 servers that are 6 – 11 years old, which from a computer capability perspective is severely out dated<sup>2</sup>. In addition, there are construction issues with the server rooms that risk the safety and security of the data housed in the servers.

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<sup>1</sup> Average computer on campus is 9 years old

<sup>2</sup> Servers should be replaced every 4-5 years to keep up with processing capability improvements



Replacing out dated servers and bringing the GCC server room up to standard could run over a million dollars. This does not include the cost of updating the servers on a regular basis. Evolving the GDC to a cloud technology will dramatically decrease the investment in servers and server storage, while increasing access to powerful computing capabilities that can scale with demand.

In 2019, we will build the model and process workflow for migrating to the cloud platform. We will then undergo a series of pilot projects to validate the model and estimate the amount of baseline computing capability we will need in-house versus hosted via a third party vendor.

### **Organizational Structure:**

To successfully grow and enhance research at Texas Biomed, scientists will rely on administrative support that is accessible, reliable, efficient and customer-focused.

Historically, the IT organization was highly fragmented with IT serving as a function of each department supported by a minimal level of campus wide IT service to connect the departments.

The new IT Services organization will focus on customer service. For the institute this means quickly turning around support requests while providing cost effective and knowledgeable assistance with technology, software, and software development. It means continuously learning new skills and tools so that the IT Services organization is where the researchers turn when they need help with software installation, development of a new software tool, or best practices for data management and analysis.

Throughout the year, we will define and implement best practice policies and procedures related to our IT infrastructure. In 2019, will have identified specific actions required to streamline the processes and resolve system issues:

- **Replace the Track IT! IT Ticketing System**

The Track IT! IT ticketing system does not provide the reporting, data segmentation, ease of access for users, mobile access for the IT team, or dashboard functions needed to manage and report on the support requests from the campus users. Modern ticketing systems are much more powerful and provide better reporting and interfaces to both users and the IT team.

- **Roll Out an Enterprise Dropbox License**

There are over 100 Texas Biomed Dropbox accounts in addition to personal accounts used to share and manage Texas Biomed data. An Enterprise license is required to provide account management and tracking. The Enterprise license also provides unlimited data storage and the ability to shut off access to an Institute account when someone leaves.

- Resolve Critical “End Of Life” Issues
  - Oracle Financial System – used for all financial and accounting operations (note: End of Life is Nov 2018)
  - Shoretel Telephone System – used for all internal and external telephone services
  - Hitachi Network Accessible Storage (NAS) – used to store and manage all of the research data
  - SQLMed – support pathology operations
  - Windows 7 – used buy over 250 computers on campus

### **Facilities and Infrastructure**

Transitioning to fewer, more functional and contemporary buildings requires a phased approach that priorities needs and aligns with anticipated funding.

The Facilities and Maintenance organization is running on a mix of paper records and Excel spreadsheets.

Automated, collaborative, and coordinated tracking of equipment and facilities, resource planning, and maintenance management is critical minimizing disruption to researchers, animals, and support functions during this transition.

The comprehensive plans for the campus renovation and growth make a Facilities Management System (FMS) a critical 2019 priority.

### **Training and Career Development & Culture**

The future training and career development program is accessible, equitable, and provides opportunity for employee advancement. Currently there is no mechanism for communication and coordination of training and career development resources across campus. Ensure consistent training experience.

Texas Biomed’s culture will support collaborative science by embedding shared values and behaviors into all processes (recruitment, hiring, onboarding, communication, performance management, training, rewards & recognition, career development, and succession planning).

Human Resources (HR) is responsible for the majority of the information related to these processes. The small organization is currently running on Excel spreadsheets, components of the Oracle finance system, and paper records. A HR Management System (HRMS) combines recruiting management, employee engagement, and employee evaluation. The HRMS also includes a Learning Management System which will help ensure access to training and promote a consistent training experience.

The strategic importance of retaining and recruiting top talent makes getting a HRMS in place a critical 2019 priority.

## APPENDIX

### Core Competency and Foresight Analysis

The following is excerpted from a series of reports prepared by TEconomy, a research, analysis, and strategy partnership that is focused on independent foresight analyses for scientific and engineering organizations. The purpose of these reports is to ensure that the direction in which Texas Biomed is heading is compatible with its core competencies, the emerging research trends in infectious disease research, and the market forces that will determine the availability of funding for infectious disease research. There are three components to this summary:

- **Core competency analysis:** to determine how well Texas Biomed core competencies align with the strategic direction in the plan
- **Infectious disease research foresight analysis:** to determine the areas likely to be most fruitful for future research
- **Market foresight analysis:** to determine the potential funding environment in order to test the feasibility of the overall plan

#### Core Competency Analysis:

*Excerpted from TEconomy Partners Research Report I: An Independent Assessment of R&D Core Competencies.*

Working to understand and address the challenges [of infectious diseases] is a scientific community dedicated to improving human health and combatting the deadly and debilitating effects of disease. Texas Biomedical Research Institute is a part of this community – operating a leading independent life sciences research institute on the frontier of research to understand the biology of many of these threats and seeking to identify novel countermeasures, diagnostics and therapeutics to preserve or restore human health. Researchers at Texas Biomedical Research Institute (Texas Biomed) are at the forefront of researching and developing solutions to some of the deadliest diseases on the planet and the Institute has developed the specialized infrastructure and expertise required to progress knowledge discovery and innovation in infectious diseases together with multiple other diseases and disorders.

The infrastructure and base of expertise at Texas Biomed is especially suited to a focus on infectious disease research but also includes other areas of medicine that may benefit from the infrastructure and expertise contained on the campus, particularly where opportunities for cross-disciplinary research exist. Genetics, molecular biology, advanced imaging, animal models, and computational resources at Texas Biomed are leveraged for work in cardiovascular disease, metabolic diseases, cancer and other areas, and important contributions are being made by Texas Biomed scientists in these areas of medical science. It is, however, in infectious diseases where the majority of Texas Biomed work converges around a common research expertise and infrastructure.

With robust biosafety facilities able to house BSL3 and BSL4 research programs, world-class non-human primate colonies comprising a diversity of species (macaques, marmosets, and baboons), high-performance computing and high-throughput gene sequencing, and specialized infrastructure for producing recombinant antibodies and other biotechnologies, Texas Biomed is quite uniquely resourced in terms of private independent research institutes able to advance knowledge, diagnostics, and countermeasures against infectious diseases (including human infectious disease and similar pathogens infecting closely related primate species).

TEconomy Partners has been tasked by Texas Biomed to provide an external perspective on the Institute's core competencies, their relation to trends and the future of biomedical research (particularly in infectious diseases) and to evaluate data resources in terms of comparative benchmarking and other factors currently under study by the Institute for planning purposes. Prior to the engagement of TEconomy, Texas Biomed and its external strategic planning consultants had already performed significant internal and external work to identify the Institute's capabilities and opportunities. This existing work has resulted in a preliminary framework for conceptualizing the future of the Institute embodied in three overarching and complementary (intersecting) themes:

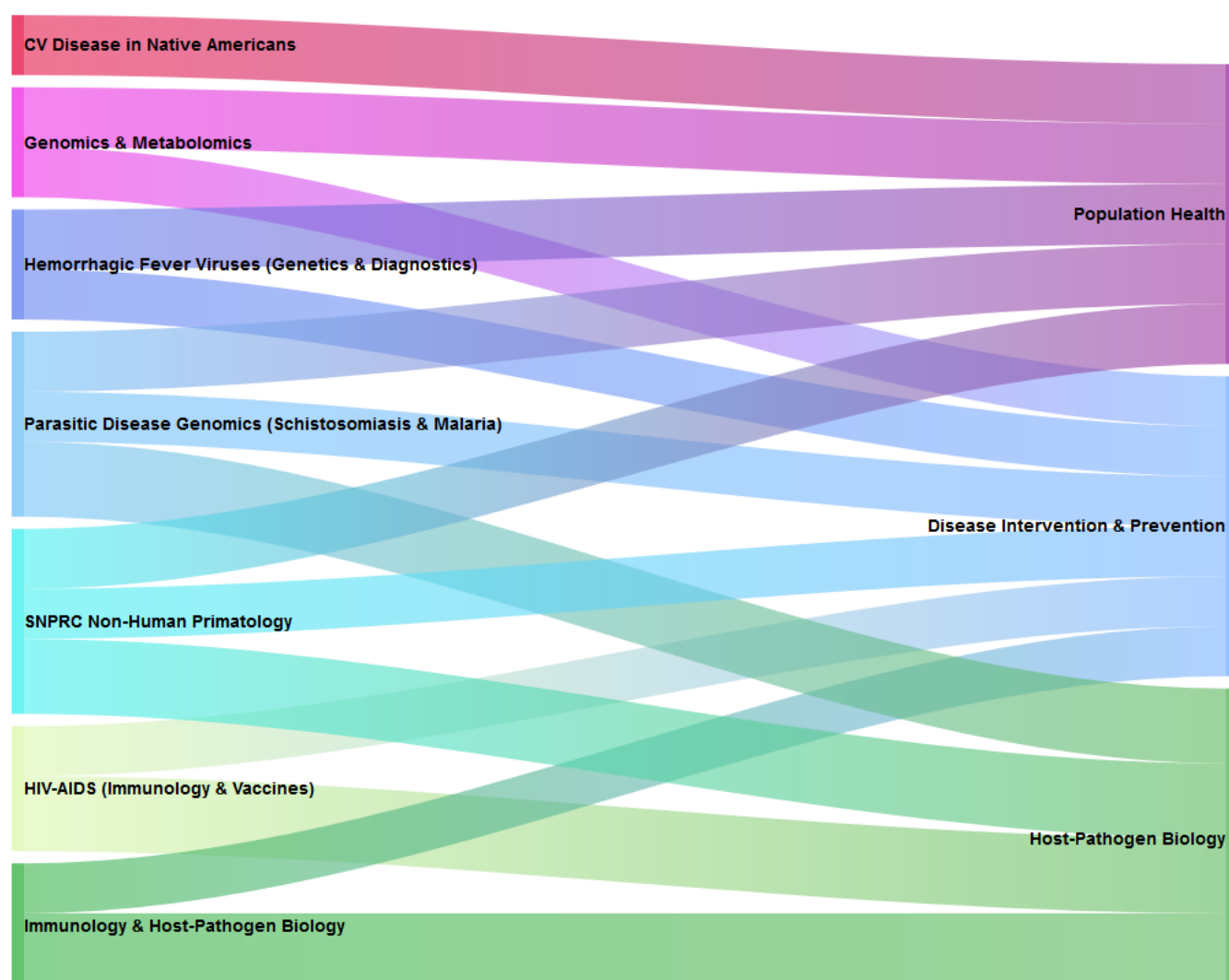
- **Host-Pathogen Interactions** – serving as a hub for researchers investigating molecular determinants of the immediate intersection between host and pathogen, including mechanisms of microbial cell entry, host microbicidal mechanisms, elements of the immune response to infection, etc. The Institute states that it believes that “a fundamental understanding of the interaction between host and pathogen is the foundation of disease control efforts.”
- **Disease Intervention and Prevention** – serving as a hub for researchers who are developing new diagnostics approaches, vaccines to prevent infection, and treatments to reduce the severity of disease or cure infection. This incorporates groups at Texas Biomed who are currently designing and testing diagnostics, vaccines and therapeutics for infectious diseases such as HIV, Ebola and other hemorrhagic viruses, tuberculosis, hepatitis C, and pertussis.
- **Population Health** – serving as a hub for researchers working on populations of humans, animals and pathogens to identify correlates of disease susceptibility or drug resistance, and to better understand disease transmission. Here, Texas Biomed scientists are using genomic and computational methods to understand biomedically important traits in defined populations – not only in relation to infectious diseases, but also heart disease, inflammatory and immune system disorders, and complex metabolic system disorders including diabetes.

As the content of these themes suggest, infectious diseases are most certainly envisioned as an ongoing core focus of the work of Texas Biomed. But, the resources and expertise embodied in the Institute, especially in the population health arena, will

also continue to be applied to other medical diseases and disorders that will benefit from the unique combination of assets and expertise at Texas Biomed.

These three core strategic areas – host-pathogen interactions, disease intervention and prevention and population health– each link to multiple thematic core competencies present in the underlying research activity and as such are a good representation of the present-day core competencies of the Institute. The figure below shows the mapping of supporting TEconomy-identified research communities to the Texas Biomed core competency areas indicating a natural fit for the internally identified areas of broad-based excellence.

**Figure: Mapping of Research Activity Communities to Supporting Roles for Texas Biomed Strategy Core Areas**



Several themes from the topic analysis indicate specializations within Texas Biomed’s broader core theme areas that may become important to highlight as differentiators for the Institute. For example, genetic and pathway identification and characterization play a key role in the underlying research activity behind many themes related to disease intervention and population health.



Where possible, these differentiating research capacities should be integrated into the definition and scope of the core theme areas in order to brand Texas Biomed's research-driven core competency areas and help to communicate the Institute's excellence within the innovation landscape of infectious disease science. The synergy between existing core competencies identified in the topic analysis and overall trends in discovery and innovation occurring in the wider infectious disease space will be explored through the subsequent analysis of the future of infectious disease R&D and used to further inform potential refinements to the three core areas.

TEconomy's latent topic analysis identified 28 core competency topics comprising seven communities of study. These seven communities readily map to the three component Venn diagram being used by the Institute.

The data indicate an Institute rooted in deep expertise in the basic science of host-pathogen interactions, immunology, and advanced genomic analysis of traits associated with human disease. Expertise is being directed to applied and translational discovery pertaining especially to, but not limited to, infectious diseases, with particularly robust research foci in:

- Filoviruses and associated infectious disease diagnostics and countermeasures.
- HIV-AIDS immunology and vaccines.
- Parasitic diseases and drug resistance.

Work is supported by several signature areas of scientific techniques and technology expertise includes:

- Genomics and quantitative genomic analysis.
- Non-human primate models of disease, and testing using primate models.
- Operation of high-threat containment and laboratory research facilities.
- GLP production of monoclonal antibodies and stem cell lines.

While infectious diseases are at the core of much of Texas Biomed's research, the capabilities of the Institute have broader application and are being leveraged for important work in metabolic diseases and disorders, cardiovascular disease, neuroscience, and population genetics.

## **Infectious diseases foresight analysis:**

*Excerpted from TEconomy Report II: The Future of Infectious Disease Research and Innovation which provided an early signals analysis to identify areas of greatest promise for future Texas Biomed research.*

In order to best position Texas Biomed as a sustainable center of excellence in infectious disease research, it is critical to understand not only the innovation landscape today but also the trends in research activity that give insights into the discoveries and technologies just over the horizon. Integrating research themes aligned with likely sources of future breakthroughs in infectious disease into strength areas in Texas Biomed's core competencies can strategically position the Institute to be a first mover in novel areas of disease treatment, surveillance, and response. Additionally, the Institute can focus investment and development activities on focus areas that lie at the intersection of current strengths and anticipated headwinds in research trends to better achieve return on investment in research.

Although it is not possible to predict the next breakthrough in infectious disease research with certainty, certain indicators of research and innovation activity in this area can function as "early signals" of new directions in research and market applications. Identifying transformative infectious disease innovations before they reach the height of their impact is a fundamentally difficult process, as they are often both highly unexpected and highly disruptive in nature. This issue is further complicated by the sometimes unpredictable nature of infectious disease research, where an unexpected disease outbreak or public health emergency can necessitate rapid innovations that otherwise may not have emerged naturally. However, by identifying a robust set of early signals the distinct innovation themes present in emerging research can be distilled from large data sets that point to areas of particularly significant potential that are likely to be sources of new innovation.

The broad themes present across sources of early signals measures point to several overarching trends in emerging research that Texas Biomed can incorporate into strategic planning to best position the Institute for future growth. First, the presence of critical mass around topics focused on the "basic science" of infectious disease demonstrates that this area of research continues to be the fundamental capacity from which new innovations are generated in the field. The presence of a large body of innovation focused around core infection biology, molecular mechanics and pathways, and early stage therapeutic discovery, even across very recent web surveillance data on applied research and new market products, affirms the importance of a strong set of core competencies in the basic biology of infectious disease in generating next generation innovations. Many of the specific innovation topics identified by the analysis rely on detailed understanding of the cellular and molecular mechanisms of how viruses and bacteria enter hosts, infect cells, and reproduce, and have broad extensibility across different applications verticals.

Texas Biomed's core competencies are well aligned with the observed trends in research and the innovations rising to prominence in this space, particularly with respect to focusing on specialization in host-pathogen interactions capabilities.

The analysis suggests that basic science is where key developments in infectious disease innovation will continue occurring for the foreseeable future, making it important to target research applications areas within the space that can be easily aligned with new challenges and market needs. Within the communities that represent this critical mass of early signals activity, several recurring themes can be observed across the detailed topic areas:

- **Next generation vaccine development:** Ongoing demand for effective vaccines that cover a wider umbrella of infectious disease variants show the importance of research in “universal” vaccines, while customized synthetic therapeutic antibodies can be tailored to emerging threats and specific human viromes. Predictive bioinformatic modeling can be used to adjust vaccine formulations to infectious disease organism evolution for quicker response to outbreak events, and novel “flexible” manufacturing technologies and processes can be used to more quickly ramp up production of vaccine supplies.
- **Precision genetic editing applications:** This innovation theme has applications across nearly all aspects of infectious disease research, ranging from creation of transgenic host or vector organisms for disease spread control, engineered resistance of host or vector organism microbiomes to infection, and biomarker identification for population health applications in rapid diagnosis and identification of population segment vulnerabilities to specific disease strains or variants.
- **Infection immunology:** An emerging area with strong connections to personalized medicine, this theme deals with systemic understanding and modeling of inflammasome activation and modulation in response to infection, innate host or vector immunity and signaling pathways for its triggering or evasion by disease organisms, and the role of immune system “memory” (or absence thereof) in responding to infection.
- **Next generation vector and resistance control technologies:** This theme deals with the management and prediction of the diseases of the future through various surveillance and intervention innovations. At the intersection with mobile technology and the Internet of Things (IoT) this area is generating device innovations in rapid point-of-care diagnostics for invasive and emerging disease strains and the complementary high performance, cloud-based computing bioinformatics capabilities that can aid real-time notification and prediction of multi-drug resistant variants and mutations. These technologies can also serve as the foundation for intelligent decision support tools for risk of zoonotic and cross-species transmission or likely human behavioral transmission routes to help those in the field monitoring infections as they unfold. In conjunction with precision genetic editing capabilities, this theme also deals with development of genetically engineered vector

interventions or induced vulnerabilities to help stem the further spread of outbreaks in progress while minimizing the potential for unintended consequences to local ecosystems.

Focusing research around these applications areas involves utilizing multidisciplinary capabilities and team structures in the basic science of infectious disease to drive translational research. The next wave of innovation in any of these areas will involve a multifaceted research enterprise that operates at the convergence of emerging technology areas like high performance bioinformatics, genetic engineering, materials science, and rapid biologic prototyping and testing.

The analysis also identified the presence of other innovation themes that were more focused in nature, and present opportunities for Texas Biomed to leverage its current and emerging strengths in research towards development of specific market solutions where applicable. Some of the more focused emerging innovation areas in infectious disease included:

- Biosynthesis of new anti-infective compounds from plants and bacteria
- Novel mosquito vector control technologies for use in heavily populated environments, driven in particular by the recent focus on Zika outbreaks
- Artificial intelligence-enhanced diagnostic tools and remote monitoring systems for infectious disease surveillance, including the use of drone technologies to monitor public health behaviors or vector organism populations
- Hospital-acquired infection growth and spread mitigation technologies
- Repurposing and re-engineering of certain virus structures for use in cancer and chronic disease therapeutic development
- Predictive modeling of outbreaks using integrated social networking, disease epigenetics, and environmental models for use in response planning
- Low cost, real-time infectious disease diagnostic devices for use in remote environments with harsh environmental conditions or lack of consistent connectivity infrastructure
- Anti-infective materials for use in implantable devices and wound healing.

Many of these more focused themes intersect with and are driven by the broader innovation themes in infectious disease and can demonstrate some of the potential end-user markets for upstream research areas.

**Market foresight analysis:**

*Excerpted from TEconomy Report IV: Assessment of the Infectious Diseases R&D Market.*

Infectious diseases represent a growing market, with demand increasing for therapeutics, vaccines, and diagnostics. Texas Biomed is engaged in research related to many of the infectious diseases with significant markets:

- HIV/AIDS (\$33.7B by 2022)

- Malaria (\$2.4B by 2022)
- Hemorrhagic Fevers (\$43M by 2021, flat growth trajectory—outbreaks may shift priorities)
- Schistosomiasis (\$55.8M by 2021)
- Tuberculosis (\$2.3B by 2022)

Texas Biomed is active in 3 core market segments of therapeutics, vaccines, and diagnostics and is pursuing work in promising growth areas:

- HIV vaccines
- DNA vaccines (a market projected to have grown at a CAGR% of 54.2% between 2014-19)
- Diagnostics and LOAC (Infectious Diseases currently comprise 4.3% of the biochip market)
- Biomarker identification
- Resistance genetics

General market conditions are projected as follows:

- Better access to treatment and diagnosis, research towards drugs with novel mechanism of action, launch of vaccines, adoption of self-testing and collaboration are expected to drive the overall market for infectious diseases.
- Pandemic preparedness is another factor that will have to be stepped up in the near future. Recent pandemics (Ebola, Zika, and Influenza) have highlighted the fact that not a single disease can be assumed to not have a global implication.

The overall market size is projected as follows:

- The global market for Infectious Diseases (treatment, vaccines, and diagnostics) in 2016 was valued at \$59.7B, and is expected to grow to about \$99B by 2022, at a CAGR of 8.9%
- Therapeutics for Hepatitis C and HIV/AIDS are high-value markets with hepatitis C markets growing at a CAGR of 13% and HIV/AIDS at a CAGR of 5.1%
- Malaria, primarily in the African markets, and tuberculosis in South-East Asian countries, are other diseases with high growth poised for the next few years. Rise of resistant forms of the disease, drive towards drugs with newer mechanism of action to combat resistance, and initiatives to increase diagnostic and treatment access by WHO and national authorities will drive the market.
- For diagnostics, HIV/AIDS, tuberculosis, and malaria are some of the high-value markets, due to high disease burden, as well as the need of clinically confirmed diagnosis

Key players are as follows:

- For infectious disease research: Gilead Sciences, Sanofi Pasteur, GlaxoSmithKline, ViiV Healthcare (joint venture between GlaxoSmithKline, Pfizer, and Shionogi),

Seqirus, a CSL Company, Medicines for Malaria Venture (MMV), Merck, Novartis and Janssen Pharmaceuticals (a Johnson and Johnson company).

- For diagnostics: Diasorin SpA, Roche Diagnostics, Siemens Healthineers, Alere (now Abbott), and OraSure Technologies

Overall, TEconomy estimates that in 2016 approximately \$15 billion was spent on the performance of infectious diseases R&D in the United States. We estimate that \$6.8 billion of this total will comprise federally funded infectious disease research (comprising \$5.52 billion in NIH spending and \$1.28 billion by other federal agencies). Spending outside of the federal government on infectious disease research likely stood at \$8.2 billion in 2016, with approximately two thirds of this \$8.2 billion comprising industry funding (\$5.5 billion), and the remaining \$2.7 billion funded by a combination of self-funding by academic and research institutions, funding by non-research conducting grant giving entities (e.g. foundations and charitable organizations), and by state and local governments.

Were the 2013-2016 growth rate of 20.6% in all health and biomedical research to hold true for infectious diseases also, and continue for 2017-2020, the \$15 billion in 2016 U.S. infectious diseases R&D has the potential to grow to circa \$18 billion by 2020.

## **APPENDIX:**

### **Path to Rebuild Campus**

Our path toward rebuilding the campus in the first eight years will incorporate the following:

- To support a planned site capacity of 45 faculty and about 650 total staff by 2026; new building development will include: a modern collaborative research building with a public level that enables seminars and small scale dining opportunities, new translational medicine animal research building (including a new ABSL4) with a new hospital, animal support spine, and centralized offices for SNPRC staff, new animal production buildings and clinics, new shipping/receiving and quarantine buildings, new central utilities building, and new roads and grounds.
- Texas Biomed needs a Heart of Campus, and a concept for organizing the site that enables connections between people working within 4 distinct functions – Administration, Research, Animal Research, and Animal Production areas. These connections can occur around common and amenity spaces, and mostly importantly, a pedestrian spine.
- The front door to the site should continue to be from Military Road. The 410 frontage road continues to get busier with new highway development. Separate and safe entries for staff and visitors, and service can both be developed from Military Road.
- Flows within the site for pedestrians, site vehicles and service, should be separated. A perimeter road around the campus can provide access to parking lots at individual buildings, and service vehicles. Outside delivery vehicles should access, deliver, and leave the site at a new shipping and receiving facility located near the southeast sector of the site.
- Phasing should focus early on opening up areas of the site for new buildings; this will require some enabling projects to relocate animals from the Research Village and the most visible of the Gang Cages, to new production housing space.
- With the majority of buildings on site being recommended for demolition, those buildings that will remain should be used to their highest and best use. This plan makes recommendations for optimizing use of the Earl Slick Research Center, and it becoming the head end of the pedestrian spine. Portions of the Slick Urschel building will be repurposed, and other marginal facilities will be upgraded such that each remaining building is well used and contributes to the overall purpose of the campus.
- To enable the security required for animals and high containment research, development should be focused inward, with a dense set of buildings being organized around the pedestrian spine that serves as the campus Heart. The Texas Biomed brand can be projected outward, but the spine will offer the gathering spaces, landscaped seating areas, and the respite that will help build a research community.



This is an ambitious plan that will require commitment, diligence, capital, and patience. Due to inherent uncertainty in any Master Plan, each sub phase can stand alone, and the program components can be accommodated, should Texas Biomed need to stop at any point to make adjustments in planning or development. Likewise, each sub phase includes site placeholders for those buildings to follow, that can be added in a sequential and connected manner to the whole.

The future program has been developed based on a 2026 faculty headcount of 45. The clearest derivative from this number is in the resulting need for lab, lab support, lab office, and collaborative settings for this research community, which was derived from recent industry benchmarks. What is not a linear calculation, has been the correlation between researchers and numbers of animals required for research. The Program and Benchmarks that follow have been vetted over a period of months and visits with all research entities, the Southwest National Primate Research Center (SNPRC), animal care staff and administration, and represents a defensible program to advance into Master Plan implementation. There is flexibility for both expansion and contraction of each program element built into the Master Plan scenarios, and the benchmarks represent both the unique needs of Texas Biomed for research, industry best practice, and trending, for these space types and functions.