

Connecting Innovation and Trust through Translational Sciences – A Need for a Community Focus and Effective Education Strategies

Filipa Godoy-Vitorino, PhD*; Michelle Borrero, PhD†; Josué Pérez-Santiago, PhD‡¶; Rubén García-García, MPh§; Candelaria Gomez-Manzano, MD**

The rapid revolution of the translational sciences landscape, including therapies against cancer, is bridging the gap between laboratory discoveries and clinical applications. During the 14th Annual Title V Symposium which took place in San Juan, Puerto Rico, a unique plenary session led by Dr. Candelaria Gómez-Manzano, a Neuro-oncology scientist at MD Anderson Cancer Center, showcased groundbreaking advances in viroimmunotherapy, emphasizing its transformative potential in oncology. Following this, a reactor panel titled “Connecting Innovation and Trust through Translational Science: A Community Approach” was convened to critically reflect on these advances from interdisciplinary perspectives. This article summarizes the main ideas discussed in this meeting with multidisciplinary researchers, including an Oncologist, Dr Candelaria Gomez-Manzano, a Microbial Ecologist, Dr Filipa Godoy-Vitorino, a Computational Biologist, Dr Josué Pérez-Santiago, and a leader in STEM education, Dr Michelle Borrero. This report summarizes the key insights focusing on how diverse scientific disciplines converge to enhance therapeutic innovation, ensure equitable access, and strengthen collaboration between researchers, clinicians, and communities.

Scientific Highlights

1. Viroimmunotherapy as a Paradigm Shift in Cancer Treatment

Dr. Candelaria Gómez-Manzano, the invited speaker, has been a trailblazer in redefining cancer treatment through viroimmunotherapy, a field that merges oncolytic virotherapy with immunotherapy to harness the body’s immune system against tumors. Throughout her distinguished career at MD Anderson Cancer Center, Dr. Gómez-Manzano has focused on developing innovative therapies for gliomas and brain metastases—cancers known for their resistance to conventional treatments. Her pioneering work, notably the co-development of the oncolytic adenovirus Delta-24-RGD (1-3), has demonstrated how engineered viruses can selectively target and destroy cancer cells while simultaneously activating a robust immune response (4). Her contributions have exemplified how translational science can move cutting-edge laboratory discoveries into real-world therapies, offering hope where few options existed before.

Of interest for the central topic of the 14th Annual Title V Symposium, Dr. Gómez-Manzano explained the generation of a pipeline using a multidisciplinary approach for a bench-to-bed strategy. Specifically, the genetic modification of adenoviruses, which cause the common cold in the general population, was generated and preclinically tested as a therapy for brain tumors by her team in collaboration with Dr. Fueyo. She highlighted the

importance of collaboration with scientists and clinicians with different backgrounds to move this new therapy to investigational clinical trials for adult and pediatric patients with brain tumors. In addition, she pointed out the continuous learning from bed to bench strategies, which informed about the immune effect of the genetically modified biological agent. Dr. Gomez-Manzano commented on the importance of education and maintaining a collaborative relationship with the trainees, as well as with philanthropic organizations that have a similar interest to the scientist/clinician groups. Finally, she expressed the necessity of training on the process of intellectual protection in the academic environment.

The panel opened by acknowledging how this approach, which synergizes oncolytic virotherapy with immune system activation, represents a paradigm shift from traditional cancer treatments and expanded on the importance of bioinformatics, microbiome, immunology and accurate patient metadata are essential for tailoring these therapies.

2. The Intersection of translational science, public engagement and training a new generation of basic and public health scientists

Dr. Borrero underscored a crucial element that is frequently overlooked in scientific discussions: the necessity of education and community trust. She asserted that scientific advancements like viroimmunotherapy are undeniably promising, but their successful implementation hinges on public understanding and acceptance. Misinformation and skepticism towards science are important barriers that must be addressed, particularly in underrepresented communities (5). The intervention emphasized the importance of embedding educational initiatives within translational research projects (6). By demystifying complex therapies and fostering scientific literacy, communities become active participants rather

*Department of Microbiology, School of Medicine, University of Puerto Rico, Medical Sciences Campus, San Juan, PR; †Department of Biology, University of Puerto Rico, Río Piedras Campus, San Juan, PR; ‡Division of Clinical and Translational Cancer Research, University of Puerto Rico Comprehensive Cancer Center, San Juan, PR; ¶School of Dental Medicine, University of Puerto Rico, Medical Sciences Campus, San Juan, PR; §School of Health Professions (EPS), University of Puerto Rico, Medical Sciences Campus, San Juan, PR; **Department of Neuro-Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

The authors have no conflict of interest to disclose. Funding Statement: US Dept Education DHHS # P031S200104, #P031S240244; Hispanic Alliance NIH-NIGMS #U54GM133807, CCRHD, NIH NIMHD #U54MD007600 and NIH-NIGMS COBRE PR-CMS 1P20GM156713-01

Address correspondence to: Filipa Godoy-Vitorino, PhD, Department of Microbiology, University of Puerto Rico, Medical Sciences Campus, San Juan, PR 00936. Email: filipa.godoy@upr.edu

Figure 1. Proposed framework for advancing translational science through innovation, collaboration, and community trust. The diagram illustrates how innovation, collaboration, education, engagement, and equity converge to advance translational science and promote health equity as explained in this report.



than passive recipients of medical innovations. Dr. Borrero highlighted strategies designed to strengthen scientific identity among students at different levels. High school students can increase their identity through project or problem-based learning led by their teachers in collaboration with researchers or through summer immersion programs in which they interact with scientists and learn how scientific research is conducted (7). Similarly, course-based undergraduate research experiences (CUREs) have been shown to have a major impact in students' scientific identity and their consequent retention in STEM fields (7). These types of programs and training ensure that future generations of scientists emerge from diverse backgrounds and are prepared to address societal needs through inclusive research practices.

A critical theme emerging from the reactor panel discussion was the indispensable role of education and capacity building particularly in regions like Puerto Rico and the broader Caribbean. Dr. Filipa Godoy-Vitorino, drawing from her extensive work in microbiome research, emphasized that breakthroughs in fields such as viroimmunotherapy, immunology, virology, and microbiome sciences are only possible when there is a strong foundation in basic sciences supported by continuous investment in education and infrastructure. Puerto Rico, despite facing economic challenges

and vulnerability to climate change, has demonstrated remarkable resilience and potential in cultivating scientific talent. The University of Puerto Rico (UPR), for example, has been a cornerstone in producing Hispanic and Latinx STEM professionals, with the University of Puerto Rico ranking among the top institutions contributing to the pool of STEM doctorates in the United States, particularly among Latina women (8). However, as Dr. Godoy-Vitorino pointed out, significant disparities remain, especially in areas like microbiome research, where infrastructure limitations, funding constraints, and underrepresentation in global studies hinder progress. The Caribbean region, rich in genetic and microbial diversity, remains underexplored, mainly in microbiome research (9). This gap limits global scientific understanding and reduces opportunities for local scientists to contribute meaningfully to fields that directly impact regional health outcomes. To address these challenges, sustained investment in biomedical education is essential. Establishing regional hubs equipped with advanced technologies and fostering international collaborations can help overcome infrastructural deficits. Fostering a robust educational framework in basic sciences is not merely an academic pursuit—it is a strategic imperative for health equity, scientific innovation, and socioeconomic resilience.

Dr. Godoy also emphasized the complexity of patient recruitment for these interdisciplinary translational projects and the importance of the work by project coordinators and metadata analysts, who include the response to questionnaires that help researchers contextualize patients' lifestyles and habits for improved tailored therapies, namely those based on microbiome and immune therapies. An evolving scientific and medical ecosystem is crucial to bridge gaps between research, clinical application, and community engagement. Beyond traditional roles of scientists and physicians, careers such as clinical research coordinators, data managers, regulatory affairs specialists, biostatisticians, and science communication experts are becoming indispensable in driving translational science forward. Integrating fields like bioinformatics, artificial intelligence, and public health into biomedical research demands professionals who can navigate both technical and societal dimensions of healthcare innovation. Awareness of new career paths is essential in Puerto Rico, including managing clinical trials, coordinating multidisciplinary projects, and ensuring ethical compliance. Addressing this requires the creation of new certificates for emerging careers and curriculum reform in addition to mentorship programs, partnerships with industry, and targeted educational initiatives as previously suggested (10). The UPR

Medical Sciences Campus Title V awards, under the leadership of Dr. Rubén García-García, contribute significantly to this effort. With their established Clinical and Translational Mentoring Teams (CTMTs) that provide academic support and foster a culture of collaboration between faculty and students, as well as the Pilot Projects Program (PiPs), which aim to empower faculty and students in transforming their theoretical framework in clinical and translational research hands-on experiences, guarantee the steady transformation of the current biomedical ecosystem.

3. The Role of Interdisciplinary Collaboration and the Emergence of Artificial Intelligence

Dr. Godoy guided the discussion toward the necessity of interdisciplinary collaboration in advancing translational science. She noted that breakthroughs like those presented by Dr. Gómez-Manzano are only possible through the convergence of fields such as virology, immunology, computational biology, and education.

Dr. Pérez-Santiago illustrated how collaborative networks allow for the integration of large-scale data analytics with clinical insights, leading to more robust and adaptable therapeutic pipelines. The integration of artificial intelligence and machine learning models allows researchers to effectively integrate and analyze complex datasets. Clinical, scientific, and community perspectives generate heterogeneous types of datasets that measure systems at different levels, which can allow understanding of intrinsic and extrinsic factors influencing therapeutic responses. This approach allows researchers to uncover intricate patterns and associations that may be missed by traditional methods, thereby enhancing the understanding of cancer risk factors (11). Through the development of predictive models, ML enables more accurate assessment of individual risk profiles and supports personalized prevention strategies (12).

Artificial intelligence is rapidly transforming the landscape of cancer research and treatment, offering powerful tools to enhance diagnostics, personalize therapies, and optimize clinical decision-making. AI can help identify patterns of disparity by analyzing large datasets that reveal gaps in care, outcomes, and access across different populations. When designed and implemented responsibly, AI-driven models can support the development of inclusive precision medicine strategies that account for genetic diversity, social determinants of health, and underrepresented groups in clinical research. Yet, there is a critical need to ensure that AI algorithms are free from biases that could perpetuate existing inequalities. Integrating AI into cancer care with a focus on equity requires collaborative efforts between data scientists, clinicians, policymakers, and community stakeholders (13). Incorporating training in AI and other computational skills into the education of future scientists is imperative and we have training grants in Puerto Rico that will guarantee the reduction of the knowledge gap and thus advance the translational research pipeline.

4. Building Trust: Transparency and Community-Centered Research

A key takeaway from the panel was the consensus that fostering public trust is as critical as scientific innovation itself. Dr. Borrero advocated for transparency in communicating both the potential and limitations of emerging therapies. She

warned against overpromising outcomes, which can lead to disillusionment and distrust.

Dr. Godoy emphasized that trust is cultivated when communities see themselves reflected in research through representation in scientific teams. For her microbiome work, Dr. Godoy often participates in community studios where microbiome topics are emphasized, and communities understand how lifestyle impacts microbes that live within us. These insights align with broader concerns in the medical community regarding equity in precision medicine as health disparities can be exacerbated if not implemented with inclusion in mind. Furthermore, the underrepresentation of minority groups in clinical trials has been documented, limiting the generalizability of research findings and the effectiveness of treatments across diverse populations (14). Addressing these challenges requires systemic changes, including policy reforms, community engagement, and inclusive research practices.

Dr. Pérez-Santiago underscored that while technologies like viroimmunotherapy and personalized treatments hold great promise, there is a risk of widening existing healthcare disparities if access is limited to privileged populations. To achieve equitable healthcare, it is essential to investigate the impact of social determinants in vulnerable populations to mitigate disparities in cancer care by targeting social drivers, including education, financial stability, and access to healthcare. Panelists advocated for translational research frameworks that prioritize accessibility.

Conclusions

The reactor panel emphasized that advancing translational science requires more than technical innovation—it demands public trust, equity, and interdisciplinary collaboration. Key takeaways include:

1. *Personalized and Equitable Science*: Effective therapies must account for the microbiome, genetic diversity, and social context.
2. *Science Education*: Building public trust begins with improving scientific literacy, especially in underserved communities.
3. *Collaboration*: Cross-sector partnerships are essential to move discoveries into practice.
4. *Health Equity*: Research must proactively ensure accessibility and inclusion to prevent widening disparities.
5. *Community Engagement*: Involving communities in the research process builds lasting trust and relevance.

By aligning scientific progress with social responsibility, it is possible to transform groundbreaking research into accessible, trusted, and effective therapies that improve lives.

References

1. Jiang, H., et al., Adjuvant Therapy with Oncolytic Adenovirus Delta-24-RGD After Intratumoral Adoptive T-cell Therapy Promotes Antigen Spread to Sustain Systemic Antitumor Immunity. *Cancer Res Commun*, 2023. 3(6): p. 1118-1131.
2. de la Nava, D., et al., The oncolytic adenovirus Delta-24-RGD in combination with ONC201 induces a potent antitumor response in pediatric high-grade and diffuse midline glioma models. *Neuro Oncol*, 2024. 26(8): p. 1509-1525.

3. Shin, D.H., et al., Chimeric oncolytic adenovirus evades neutralizing antibodies from human patients and exhibits enhanced anti-glioma efficacy in immunized mice. *Mol Ther*, 2024. 32(3): p. 722-733.
 4. Shin, D.H., et al., Virus Against Cancer: Paradigm-Shifting Biological Concepts. *Curr Neurol Neurosci Rep*, 2025. 25(1): p. 41.
 5. Scheufele, D.A., et al., Misinformation about science in the public sphere. *Proc Natl Acad Sci U S A*, 2021. 118(15).
 6. Faupel-Badger, J.M., et al., Advancing translational science education. *Clin Transl Sci*, 2022. 15(11): p. 2555-2566.
 7. Hernandez-Matias, L., et al., An exploratory study comparing students' science identity perceptions derived from a hands-on research and nonresearch-based summer learning experience. *Biochem Mol Biol Educ*, 2020. 48(2): p. 134-142.
 8. Melendez-Ackerman, E. and J.L. Colon, Killing the golden goose for STEM. *Science*, 2022. 375(6586): p. 1205.
 9. Godoy-Vitorino, F., Solutions to expand microbiome sciences in the Caribbean Region: an insider's perspective. *Trends in Microbiology*, 2025. 33(5): p. 475-478.
 10. Foxx, A.J., et al., Advancing Equity and Inclusion in Microbiome Research and Training. *mSystems*, 2021. 6(5): p. e0115121.
 11. Kourou, K., et al., Machine learning applications in cancer prognosis and prediction. *Comput Struct Biotechnol J*, 2015. 13: p. 8-17.
 12. Dixon, D., et al., Unveiling the Influence of AI Predictive Analytics on Patient Outcomes: A Comprehensive Narrative Review. *Cureus*, 2024. 16(5): p. e59954.
 13. Dankwa-Mullan, I., et al., Artificial Intelligence and Cancer Health Equity: Bridging the Divide or Widening the Gap. *Curr Oncol Rep*, 2025. 27(2): p. 95-111.
 14. Yu, J., et al., Characterizing Patient Diversity via Healthcare Access Determinants: A New Approach for Measuring Improvements in Clinical Trial Diversity in the United States. *Adv Ther*, 2025. 42(4): p. 1965-1978.
-