

Journal of Engineering Research

INNOVATION HUBS: LEVERAGING NANOTECHNOLOGY LATAM MARKET WITH A SUSTAINABLE AND COLLABORATIVE MINDSET

M. L. Silva

Merck Life Sciences, Barueri, SP, Brasil

S. Nieto

Merck Life Sciences, Ciudad de Mexico, DF,
Mexico

L. M. Andrade

Federal University of Minas Gerais, Belo
Horizonte, MG, Brasil

M. J. Andrade

Millipore Sigma, Millwaukee, WI, USA

A. M. C. Pedrosa

Merck Life Sciences, Barueri, SP, Brasil

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: Latin America (LATAM) have some strong research centers with a tradition of research excellence in certain disciplines such as biomedical sciences, biology, nuclear technology, metallurgy, nanomaterials, among others. Besides these excellence islands and the networks of researchers across the region (e.g., Argentina-Brazil Bi-National Center for Nanoscience & Nanotechnology(CABN); Latin America Integration Federal University (UNILA), Argentina-Brazil Biotechnology Center (ABBC), the institutional relationship between academia and industry has been weak along the years. This work will explore the implementation of Innovation hubs as a bridge between academia and industry, based on sustainable mindset, in order to create values, fostering R&D in industrial segments, leverage the prototyping in academia and connect stakeholders, especially in Chile, Brazil, Argentina and Mexico.

Keywords: Collaboration, Market assessment, Sustainability, Innovation, Nanotechnology

INTRODUCTION

This work provides analyzed data of the status of nanotechnology and sustainable solutions in Latin America (LATAM), with special focus in the following four countries: Argentina, Brazil, Chile and Mexico. Nanotechnology has already impacted the global economy, and the emerging of challenges to sustainable development promises booster the decisions for long-term investments. This, in turn, is bringing together strong interest from governments, academia, industry and investors in the most developed countries and also in some fast-growing economies, including LATAM. In fact, comparing the global funding in 2008 and 2020, during 2008 reached almost \$20 billion with over 40% from governments, about 40% of corporate funding, and over 5% from venture capital contribution (1). Just in

the United States, The President's 2021 Budget requests over \$1.7 billion for the National Nanotechnology Initiative (NNI), with an increased investment in the foundational research that will lead to discoveries that will advance a wide range of areas including key Industries of the Future (2).

Although it is difficult to estimate public funding, analysts have cited some figures. The figure given for Argentina is generally in the realm of 50 million dollars between 2006 and 2010. For Brazil, around 190 million dollars between 2004 and 2009, as stated by the Ministry of Science and Technology, not counting funds from the states themselves, which only in the cases of Sao Paulo, Minas Gerais, and Rio de Janeiro would be more than 60 million dollars in the same time period. In Mexico, estimates suggest approximately 60 million dollars between 2005 and 2010, and in Chile, 30 million dollars between 2005 and 2010 (3). Even though these figures need to be updated, they highlight the relevance of nanotechnology as an attractive research field in the LATAM region.

Globally, products incorporating nanotech reached over \$240 billion with about 65% in manufacturing and materials, 25% electronics and IT and 10% in healthcare and life sciences. Lux predicts that nanotech will touch \$3.1 trillion worth of products along the value chain by 2015 (1). In a recent report, Globe Newswire indicates that the Nanotechnology market will be 8 Billion USD by 2027, growing at a CAGR of 12.9% over the analysis period 2020-2027. Nanomaterials, one of the segments analyzed in the report, is projected to grow at a 13% CAGR to reach US\$107.4 Billion by the end of the analysis period. After an early analysis of the business implications of the pandemic and its induced economic crisis, growth in the Nanotools segment is readjusted to a revised 11.3% CAGR for the next 7-year period. This segment currently accounts for a 15% share of

the global Nanotechnology market (4).

LATAM contribution to total investment and nanotech products has been growing but still is quite small. The one of reasons for that, is the Nanotechnology, as an interdisciplinary area, requires collaboration of several scientific fields, but also connection with different specialized industries.

When we compare the number of nanotech scientific publications related to the number of patents generated, it's clear the cycle of innovation in nanotech is disrupted in LATAM. In Figure 2, a general landscape of the Nanotechnology patents published per country is presented.

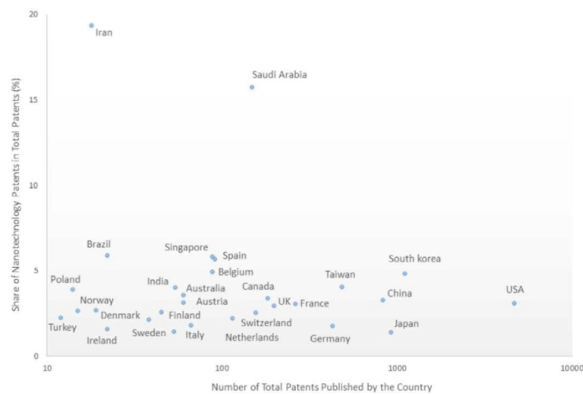


Figure 1. The share of nanotechnology patents in the total patents published by different countries in 2019. (5)

There are some efforts to improve the rate of co-authoring of academic and industry in Nanotech in the region (6), but it is not enough.

Besides the challenges of development of Nanotechnology itself in LATAM, globally the emerging of the challenges of sustainable development will reach any economic area, includes Nanotech. Subjects as renewable sources, nanotoxicology and nanosafety must be addressed. LATAM region could participate of this economic transition, due to its huge natural resources, regarding to the principles of green chemistry and sustainability.

As we look to the future, we see

nanotechnology on track for significant global expansion, driven by increased government support, technological advances, private investment, and increased demand for smaller devices. In the midst of a global pandemic, its applications for preventative care and remedial therapies are critical. Wide-spread adoption is always at risk, however, from any potential environmental, health or safety events.

Nanotechnology is changing the way we live and work, and legal and regulatory regimes will need to adapt to enable new products in new markets.

THE INNOVATION HUB

For Nanotech products implementation, collaboration is key. However, in LATAM, the prototypes are rarely transferred to commercial industries due to several reasons. In Academia, the inefficient laboratory structure, insufficient net of collaboration for prototyping, the absent of minimal viable product (MVP) assessment, not deadline sensitive, insufficient regulatory and tech-financial analysis knowledge, are some of the reasons. On the other hand, the industrial sectors have lower rate of innovation, lower qualified personnel, aversion of investment risk in R&D, especially for long-term projects.

The innovation hubs could address some of these issues, fostering the collaboration of Academia and Industrial segments, investing in the prototyping step and boosting the launching of innovative products in local markets. Merck will act as an interlocutor, powering the collaboration through connecting stakeholders, scientific support, raw-material and CMO capabilities, scaling-up, quality and regulatory knowledges.

Globally, in Merck we have been implementing Innovation Hubs in innovation hotspots: China, USA, Germany, Netherlands and Israel. As a strong platform for Merck and our partners to drive innovation worldwide,

strengthening our footprint in the ecosystem of innovation. This ecosystem helps to identify innovative concepts at an early stage and scale them to sustainable businesses. This approach is also complemented through investments into science and technology driven startups by our strategic corporate venture arm M Ventures. Through our innovation ecosystem we work with startups, academia, institutions, and cross- industry corporations around the globe.

In LATAM, the Nanotech Innovation Hubs could be used to foster the innovation ecosystem, and the cycle of innovation could be completed. Recently, Brazil updated the Innovation law (7, 8), that provides for incentives for scientific development, research, scientific and technological training, filling the gap of the legal framework between universities and private initiative.

REFERENCES

- [1] A.Nemirovsky, O.N.Oliveira, F.Audebert, C.Constantino. Nanoscience and Nanotechnology in Latin America. Int. Journal of Nanotechnology and Molecular Computation, 2010
- [2] <https://www.nano.gov/sites/default/files/NNI-FY21-Budget-Supplement.pdf>
- [3] Foladori, G. Nanotechnology Public Policy in Latin America. Prob. Des vol.47 no.186 México jul./ago. 2016
- [4] <https://www.globenewswire.com/news-release/2020/07/16/2062964/0/en/Global-Nanotechnology-Industry.html>
- [5] <https://statnano.com/news/67294/2019's-Most-innovative-Countries-in-Nanotechnology>
- [6] D.S.Reis, V.L.Oliveira, M.L.Silva, R.M.Paniago, L.O.Ladeira, L.M.Andrade. Gold nanoparticles enhance fluorescence signals by flow cytometry at low antibody concentrations. Journal of Material Chemistry B, 2021.
- [7] LEI Nº 13.243, DE 11 DE JANEIRO DE 2016. http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/l13243.htm.
- [8] LEI Nº 10.973, DE 2 DE DEZEMBRO DE 2004 http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.973.htm