

Nanosciences, Nanotechnologies, Materials and New Production Technologies Deployment in Latin American Countries



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Nanotechnology innovates treatment of tropical diseases

Most Latin American research in nanotechnology for medical applications is still in the basic research phase or targeting platform technologies rather than therapies or diagnostics for tropical diseases including tuberculosis. Worldwide, most translational nanomedicine research targets products for which a business case can be argued, e.g. cancer therapies or diagnostics. Therefore, a common European – Latin American strategy for deployment of nanotechnology for health for the benefit of the Latin American population should aim at capacity building for translational research targeting tropical diseases as well as cancer.

Decision makers and stakeholders: nanomedicine researchers, nanotechnology companies, pharmaceutical and medical devices industry, EU and government departments for research, industry and health, international funding bodies, hospitals and medical professionals, patients associations.

Introduction: overcoming fragmentation and setting priorities

Nanomedicine is defined as the application of nanotechnology to achieve innovation in healthcare. Nanotechnology is the development of materials, devices and products with functional feature sizes between 1 and 100 nanometre (10-9m) in one or more dimensions. Notwithstanding large differences in resources and capabilities between countries, there is a considerable amount of research on nanomedicine in Latin America. Drugs and therapies, drug delivery and materials for different applications are the most developed areas of research. Research groups in most countries have some degree of cooperation with international research networks, within and outside the region. Academic-industrial cooperation hardly exists. Enhancing cooperation between the European Union and Latin American countries will require further discussion on priority areas for cooperation.

Several Latin American countries have crossed the “epidemiological transition” and present a very similar pattern of diseases and causes of death to most developed countries. Although tropical diseases are still causing suffering among large parts of the population, most nanomedicine research seems to be directed to a more global landscape of medical issues. Apart from the WHO and Bill and Melina Gates foundation, funding for innovative treatment of tropical diseases is limited.

Some proposed solutions

Several Latin American and European researchers have taken initiatives for overcoming fragmentation in the nanomedicine research communities. At international level, the International Society for Nanomedicine offers the platform where these initiatives meet. This is hosted by the European Foundation for Clinical Nanomedicine (CLINAM). A central node in Latin America is the Argentinean Association for Nanomedicine Nanomed-Ar, that has established contacts with leading researchers in other Latin American countries. In Europe, some active members of the European Technology Platform on Nanomedicine are undertaking initiatives for crossing the Atlantic. However, other European and Latin American scientists have also deployed activities.



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Experts expect that bridging the gap between academia and industry in Latin America will take a long time. Some see opportunities for engaging the biotechnology industry in the region, which is already quite innovative. Broader stakeholder engagement including ministries of health, hospitals, medical professionals and patients associations is considered necessary but currently non-existent. Repatriating Latin American nanoscientists with experience in the pharmaceutical industry abroad may also foster translational nanomedicine.



Figure 1: Discussion on nanomedicine during NMP-DeLA workshop in Santiago de Chile.

Promising technological developments

Some Latin American research groups and spin-off companies are developing nanomedicine-based products and therapies. Examples include research in drug delivery and diagnostics targeting Leishmaniasis and Chagas Disease at the Foundation Oswaldo Cruz and several universities in Brazil since 2004. Furthermore, creams for photodynamic therapies for cancer and leishmaniasis are incorporating photoactive nanoparticles with an antimicrobial effect under ultraviolet light. Another interesting development is the use of endemic biological or mineral resources found in Latin America. A cancer therapy based on Llama antibodies is under development in Argentina. In Chile, extremophiles found in Antarctica are used to synthesize quantum dots that can be applied in nanomedicine.

Organising the intervention - Short term (2020)

Within five years, the current initiatives in the scientific community to set up a Latin American

Nanomedicine Platform should be well established with mirror organisations in all Latin American countries with a significant research community in nanomedicine. By then, it is advisable to have a strong presence of industry and government bodies responsible for research and health along with the scientific community, to foster translational nanomedicine. The affiliation of patients associations, medical professionals and social and human scientists should help target healthcare needs beyond socio-economic and industrial interests. Regular exchanges and cooperation with international counterparts in the International Society for Nanomedicine and the European Technology Platform for Nanomedicine should be addressed to building capacity in Latin America.

Nanodrug delivery systems that are already available or in the pipeline for cancer drugs may by that time also be available for neglected tropical diseases. A key bottleneck is investment in the preclinical and clinical testing of the encapsulated drugs.

Medium to long term (2020-2030)

Within fifteen years, the UN Sustainable Development Goals set two targets for health to which nanomedicine may contribute.

“3.3 End the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases.” Nanodrug delivery systems may contribute to solutions for neglected tropical diseases through encapsulating toxic drugs. Fast and cheap point-of-care diagnostics may by then be available for communicable diseases such as tuberculosis.

“3.d Strengthen the capacity of all countries, particularly developing countries, for early warning, risk reduction, and management of national and global health risks”. Distributed wireless monitoring networks enabled by nanobiosensors targeting tuberculosis, tropical diseases and other health risks may offer solutions. The key bottleneck is the incorporation of nanotechnology based solutions in international funding strategies by the World Bank, IMF and national governments.

Further reading

This fact sheet is based on literature and experts participation in interviews and events reviewed in the NMP-DeLA final roadmap and health roadmap.

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