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Exploring nanotech touch to phytopharma

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Recent research findings have shown the detrimental effects of common synthetic chemicals used in hygiene and agriculture. In the light of serious health concerns, there is growing demand to adopt eco and earth friendly traditional herbal extracts by refining and fortifying with new technologies to ensure compliant with contemporary product standards.

The challenges such as lower bioavailability and higher cost compared to synthetic counterparts have made the traditional phytomaterials suffer from suboptimal efficiencies. Apart from that, the higher costs and volatility due to crude application dosage, lower production yields, adhoc sourcing of this largely unorganised sector too have been the factors that added negativity to it. Now as a ray of light, nanoprocess chemistry has the potential to bring down the dosage levels by improving their efficacies with an impact on cost effectiveness.

Working in this direction, the Bangalore based Applied Nanomaterials has been doing research on the nanobio growth stimulators and bio pesticides derived from herbal extracts. The company's progress since its inception in 2012, has been slow and steady. It already offers commercial products and solutions for numerous functions such as eco-friendly nano coatings for UV protection, super hydrophobicity, thermal insulation, lubrication, antifungal and corrosion protection functions.

Taking the difficult route

Dr Vijay Kunuru, founder and executive director, Applied Nanomaterials has always been passionate about science and later inspired by nanotechnology's potential greener solutions for contemporary pressing issues like global warming, cleaner energy, improving air quality, affordable healthcare and poverty alleviation.

After earning his PhD from Cambridge University and completing Post Doctorate research from Cornell University, Dr Kunuru

chose to tread the difficult path of becoming an entrepreneur despite green pastures that he came across due to his academic credentials. He is of the firm belief that sustained efforts in a hostile situation too could bring about change.

"The global market conditions are favourable for rapid growth of Indian economy especially knowledge intensive manufacturing due to its highly skilled work force and large domestic consumption," Dr Kunuru explained adding further, "It was my conviction that there would be a real need for a company like Applied Nanomaterials to deliver nanotechnology solutions for a wide range of markets. This is in line with my aspiration to take up a career which has larger impact on the society yet involving my first passion for science and technology."

Where traditional science meets modern technology

The growth of nanotechnology has been gradual against the predicted tangential growth curve partly because it is highly complex and requires intensive capital and skilled human resources. The global economic slowdown has also hampered its research funding and risk capital for commercialisation due to abstract understanding of technology, reactivity, stability and usability combined with largely expensive processes and methods. Despite its sluggish growth, one can find numerous daily use products enabled by nanotechnology such as coatings, photovoltaics, batteries, lubricants, sunscreens, diagnostics, sensors, cancer drugs, LEDs, water filters along with numerous products.

"Interestingly India's legacy in nanotechnology and herbal science can be traced back to the ancient times. Avurvedic bhasmas are ancient form of modern nanotechnology. There is huge potential waiting to be untapped in commercializing traditional herbal science benefits with modern assessment and process methods," Dr Kunuru said while sharing his inspiration behind the work he is undertaking.

He explains further, "Nanotechnology enables better bioavailability, solubility, interfacial transport by overcoming size barriers for traditional phytochemicals. Owing its nanometric dimensions, it offers efficient membrane transport and higher bioavailability at lower dosages, thus lower toxicity if any. In this context applying nanotechnology methodology to phytomaterials and its derivatives is win-win strategy in terms of better efficacy, economics and environmental sustainability."

Talking about the applications, Vijay mentioned, "First foremost the health and medicinal benefits of phytomolecule has been well known for long time, which are human and eco-friendly as compared to the conventional synthetic chemicals. The primary markets are healthcare, nutraceuticals, oral care, plant nutrition and pest protection."

Business model based on partnerships

The four business verticals of the company include nano-additives, nano-composites, nano-materials and herbal nano-formulations. Currently it offers commercial solutions for UV protection, thermal insulation, water repellence, antimicrobials, disinfectants for markets such as coatings, energy, appliances and personal care segments. It intends to provide nanotech innovative solutions to commercial products in a cost effective way and could act as an effective bridge between academic research innovation and industry in India.

The company has collaborated extensively with various stakeholders across the product chain. Currently, it is partnering with conglomerates like Godrej industries, Laursen & Toubro, ACG capsules, and Phytogen pharma in addition to institutes like Indian Institute of Technology, Madras; Indian Institute of Science, Bangalore; Indian Institute of Science, Delhi and State University of New York. It is working with the ACG capsules on capsules auxiliaries pigments and natural colours. Apart from that, it is working with Cipla on porous nano- Silica as drug delivery systems for chemotherapy. With Phytogen Pharma,it is producing herbal based nanobiopesticides, growth stimulators and disinfectants. The company is actively pursuing synergy opportunities on joint product development with Cipla, Dow and Israel chemicals for numerous products.

"We have numerous technologies under pipeline and ready to be commercialised for lubrication, refrigeration, smart coatings and packaging. Now, we are entering into the area of herbal extracts and phytomaterials, which can revolutionise agriculture and primarily health care space. Therefore, the company's future prospects are extremely bright," concludes Dr Kunuru.
The unclear regulations and validation through clinical trials further contribute to the delay in the growth of nanotechnology in advance medicine and healthcare. Developing countries like India have all favourable conditions and opportunity to invest in the risk capital to develop cost effective nanotechnology solutions. So the need of the hour is that along with "Make in India" we should also focus on "Innovate in India"

Hard Talk:

Sharing his thoughts on innovation, Dr Kunuru opined, "I have found that Indian manufacturing landscape was operating under a highly fragmented environment and a wide gap exists between industry and academia in terms of knowledge,

perspective and philosophy, which doesn't promote indigenous innovations in the current setting. It would be unsustainable for an economy like India not only its sheer size and consumption but its aspiration to become an emerging leader in a global scenario."