Interview with Sirirurg Songsivilai, Executive Director, NANOTEC

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Tags: NANOTEC

As one of the leading figures of nanotechnology in Thailand, would you introduce yourself to our readers?

I am a researcher by training. I hold a medicine degree and PhD in molecular biology, and I developed my research skills by working on infectious diseases. I then worked on the application side of medical technology, the development of diagnostics.

Twenty years ago the diagnostics industry in Thailand was very small, so I helped creating spin off companies from university to start new biotech industry, mostly on medical diagnostics for Thailand.

During this time, Thailand and NSTDA were interested in emerging technologies that would help driving Thailand in the new decades, including incorporating nanotechnologies in medical science and other fields. Thus began the establishment of NANOTEC in 2003. I became the center executive director in 2007.

What have been in your view the most important developments in nanotechnology development in Thailand since you took the helm of NANOTEC in 2004?

Nanotechnology is still relatively new and very exciting. Each country integrates the nanoscience differently depending on differences in their overall context. In the past ten years, many countries

started to develop their own nanotech capabilities, they look at the strength and weaknesses of areas to develop. Five years ago we thought that nanotechnology industry would develop in the same way the IT industry developed. This turned out not to be the right prediction; there is no nanotech products as such, but nanotech is embedded in many if not existing products. Nanotechnology does not make a product, but it makes a product better.

Today, nanoscience is considered as an enabling technology, enabling other things to become better, and humans now have the knowledge to control molecules and the ability to make things smaller and better.

The Thailand National Strategic Plan for nanotechnology calls for nano-products to account for as much as one per cent (USD 3 billion) of the country's GDP by 2013. How is this target measured then?

Every country now realized that it is virtually impossible to measure the economical size of nanotechnology, as there is no nanotechnology industry per se. But nanotechnology is now in almost every products. Thailand for instance is the key global producer of hard disks, and the industry is now using a lot of nanotechnology to produce smaller disk drives that use less energy and still have much larger capacity, and that is possible through technology on a nano scale. We could say that the global hard disk industry is nanotechnology-driven and that nanotechnology contributes billions to the economy; but it is of course hard to prove the exact contribution. However, we do know that 10 percent of Thai industries apply nanotechnologies in their business.

One of the challenges for nanotechnology around the world is the translational aspect; could you outline NANOTEC's strategy in bringing translation about?

When looking at the progress of nanotechnology development in Thailand we often look at two elements. The first element is infrastructural investment in universities and the Science Park. The second element is the development of human resources. We encourage people to further their study in Thailand and overseas; we invest on the promotion of nanotechnology courses in Thailand and also support R&D in universities. The indicators show that these investments are successful, which is especially visible in academic achievements. The number of publications on nanotechnology has grown ten folds compared to five years ago. Nanotechnology is one of the fastest growing fields in academia in Thailand. This is not a unique development in a global perspective; in other countries we see similar figures.

In the next development stage of nanotechnology in Thailand we need to utilize our academic achievements and grow further on our strengths. To give an example, after five years, Thailand

slightly modified the development path of nanotechnology. We decided to utilize nanotechnology in existing industries, in fields where there is a need and a possibility to quickly implement it. The first field is advanced materials, where nanotechnology is used as a catalyst to develop composite materials, even for textiles. Thailand has a very well developed textile industry that uses nanotechnology especially in the surface modications, resulting in new properties.

Another area is extending our knowledge in bioresources. The tropical herbal medicine ingredients are typically unstable. Thailand is unique in bio resources as we are somewhere in between China and India, a melting pot so to say. We use a lot of herbs, plant based, insect based, and even some animal based ingredients. Most of those active ingredients are intrinsically unstable as they are often water sensitive or sensitive to heat or UV light, which limits the applications. Still, Thailand exports billions of Baht of active ingredients each year to be used by the cosmetics and herbs industry. To help the industry, NANOTEC develops encapsulation expertise for use to stabilize herbal active ingredients.

To stabilize the complex molecules we are talking about a number of techniques; for instance encapsulation technologies, for which we have expertise that can be applied to various fields ranging from modern injectable medicine to food supplements and cosmetics. Cosmeceuticals, is growing in popularity among consumers, because these products are easier to control and adapt to the market.

We are focusing on neutraceuticals as well, and as well as are developing new types of medicine which is still based on the same knowledge. At NANOTEC we invest close to 40 percent of our resources to biology applications of nanotechnology. We have a Nano Delivery System lab, which focuses on drug delivery ranging from traditional to modern drugs. We furthermore manage a Nano-cosmeceutical Lab, which is quite unique. Another team we have focuses on target discovery for common diseases, with a main focus on cancer of the female cervix. The Nano-cosmeceutical team looks at two aspects: at making known products better and easier to use, and at exploring new active ingredients. The in-house team does not focus on basic discovery but follow the leads provided by industry or other labs. To give two examples: we work with a very well known herbal medicine manufacturer in Thailand, for instance on hair growth products. We also work on relatively unknown herbs that show antioxidant activity, which is very good for the skin. Antioxidant herbs face the problem of unstable ingredient source, and we work with suppliers to stabilize this based on our capability to identify the active ingredients.

During the 2011 Thailand-Korea Joint Symposium on Nanobiotechnology, NANOTEC agreed with the Korean Research Institute to collaborate on nanotechnology-based drug delivery initiatives. Would

you outline the importance of this cooperation and NANOTEC’s overall international partnership strategy?

We are working on biology aspects and sensor technologies. Nanotechnology allows for smaller sensor types that are easier to use. The collaboration with the Korean institute is based on sensor technology, and the aim is to develop sensors for new diseases. We combine our strengths: our target discovery team is very good at identifying the targets, and the Korean team has great knowledge on electronic sensors. For instance we are aiming to develop new faster detectors for common diseases in the Asian population.

Can we expect more international partnerships in the future?

NANOTEC is very active; we position ourselves as the R&D center that utilizes technologies for the benefit of the region. We collaborate with teams looking at the common interest; the Korean collaboration is one example of that. We are extending our collaboration to improve our core strengthen and knowledge on certain molecules.

We also discussed this international aspect with Dr. Kirtkara of BIOTEC, and she explained how Thailand is becoming the regional leader in biotechnology, setting up R&D collaboration and providing education to foreign students.

We are also an active player on nanotechnologies through our regional Asia Nano Forum, which includes 16 member economies. Thailand will play host country for the upcoming Asia Nano Forum Summit at the end of the year.

Could Thailand rival Singapore in nanotechnology?

Yes and no. Thailand and Singapore are leading in both the academic side and in application. We are complementing each other, because our strengths are different. Electronics and physics are areas in which Singapore is considered a dominant player; we on the other hand are very strong in nano-biology and development of advanced materials and in its applications.

As the pivotal person in Thailand’s nanotech landscape, where do you wish to take the development of nanotechnology in the coming years?

We will soon saturate the application of technologies in existing industries. In the existing industries we will see the implementation of technologies in textiles, in materials, and in herbal medicine. In the upcoming years, we will see nanotechnology entering new industries as well, such as agro-industry, which is very exciting for Thailand as it is one of our biggest industries.

Environment and energy are other future areas of application.

In life sciences, there are two areas where we will soon see application just behind the herbal medicine. Firstly materials for biological use: we work with universities and industries for implants and prosthetics. The second area is sensors. We will see a new generation of sensors for health monitoring.

What is your final message to the readers of Pharmaceutical Executive about NANOTEC's commitment to putting Thailand on the global nanotechnology map?

Thailand is very committed to the development of new and emerging technologies. The new Thailand National Nanotechnology Policy Framework starts this year and will run for the coming ten years. Within this period we set ourselves a challenging targets: to grow nanotechnology ten folds in terms of resource investment and human resources. Thailand will step forward as one of the leaders not only in the region but in Asia in nanotechnology for health science and agriculture.

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