Editorial

Building biotechnology in India – Drugs are not the answer

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I have had the pleasure of participating in national forums on biotechnology development in diverse countries. A common theme I see is that emerging economies wish to develop 'a biotechnology industry like the United States.' I generally temper these ambitions by explaining that the United States does not have a biotechnology industry *per se*, but rather a handful of states have very strong biotechnology concentrations and many other states are still trying to build their domestic biotechnology industries. So the lesson for many emerging economies is to set ambitions at the US-state level rather than the US-national level. Furthermore, I also caution against aiming for drug development. Drug development is extremely expensive and risky—focusing on domestic agricultural or industrial biotechnology opportunities may be a better option.

I was recently in New Delhi, presenting data from the *Scientific American Worldview* project, where I have ranked national biotechnology industries for many years.[1] One may argue that novel drug development should be a target for Indian biotechnology and pharmaceutical companies, but my data suggest otherwise.

When I presented the Indian innovation figures and asked the audience to guess where they ranked. Much to their amazement, India was ranked with the bottom five of the 50+ countries assessed. The issues are myriad — poor patent protection, infrastructure problems, an insufficient quantity (not quality!) of skilled workers, etc.

Compounding this issue, I also refered to my study on pharmaceutical globalization which examined the mobility of pharmaceutical innovation.[2] In reviewing the locations of pharmaceutical patent inventors since 2000, I was surprised to find that it had essentially never moved—The US, Western Europe, and Japan have and still do dominate pharmaceutical invention. This is a sobering finding for any region (a country or even a province/state within one) seeking to improve their drug discovery output. It is notoriously hard to seed new locations.

So, where does that leave India and every other country that doesn't currently have a strong drug discovery industry? Should they simply give up? Clearly that is not a good plan, and it is also not practical because of the strong social, economic and political benefits that come from drug discovery and development. Rather, I think that countries seeking to develop drug discovery capacity should focus first on building foundations for drug discovery, and this is often best done by not working on drugs![3]

One of the problems with providing stimulus to foster novel drug development firms is that, if successful, the talent, products, and profits often move to one of the established drug development hubs. It is akin to trying to build an broadcast entertainment industry outside Hollywood or developing a sports team in a new city—if you do develop talent, much of it will be drawn to the existing hubs.

So, given that successfully developing drugs outside of existing hubs has been shown to be rare, and that any products and talent developed outside of existing hubs is also likely to relocate to existing hubs, what can be done? A better approach is to focus on uniquely domestic needs, which can be later adapted to serve broader problems.

Brazil is a world leader in bioethanol production. This capacity was developed with the initial help of tax subsidies, but it also followed a natural path—sugarcane processing. In Brazil bioethanol is produced by fermentation of bagasse, the pulpy plant mass left behind after sugarcane sugar extraction. Because bagasse was already collected at sugar processing plants, biomass producers simply had to set up shop at the collection points. Furthermore, because bagasse is expensive to ship, it means that the bioethanol companies are likely to stay local.

To come back to the Indian example, it is important to recognize that drugs are but one way to improve health. Another way is to prevent onset of disease. When I was in New Delhi, holidays were providing a respite from smog as farmers upwind from Delhi had temporarily stopped burning crop residues. Investments in industrial or agricultural biotechnology applications to provide alternatives to burning crop residues can improve rural employment while reducing pollution and pollution-borne illnesses. These domestic solutions are unlikely to relocate, and can build a foundation for

further development in other areas, such therapeutic biotechnology.

REFERENCES

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